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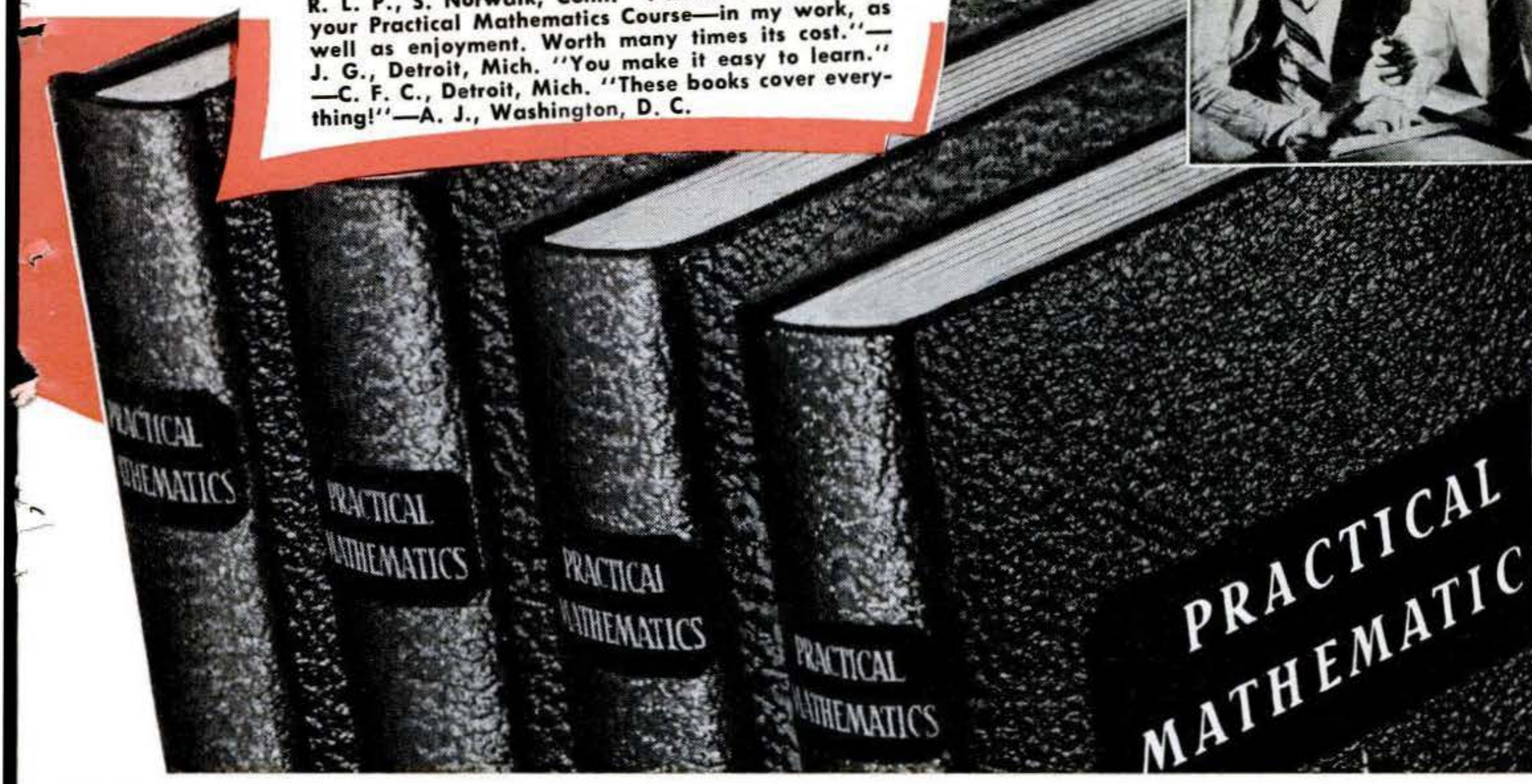

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This Month's Big Features:

Engineers Invade Another Wilderness..... 98

500-Lb. Car for $500.....104

Why Our Winters Are Getting Warmer.....114

Shaw Drives the Minx.....124

Portable Machines Build Houses Fast.....135

How Rink Rollers Are Made.....154

Is Your Car as Pretty as a Jeep?.....161

How We'll Fly to Venus.....172

How to Use Green Lumber.....177

Saving Heat and Money.....182

Starting Your Car in Zero Weather.....189

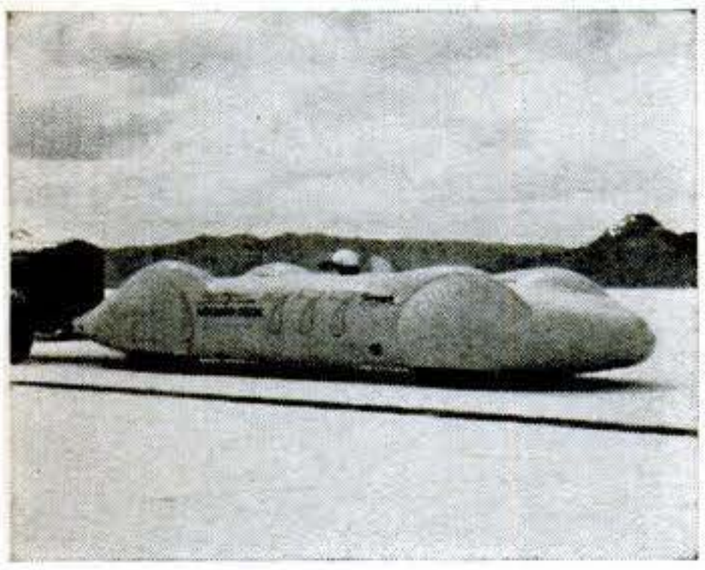
Gus Gives the Air Force a Lift.....196

New Poison Fools Rats.....201

How to Service Your Auto Radio.....216

Silicones in Your Home.....221

How to Judge Used Power Tools.....232



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(More features and departments are listed on page 4.)

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Picture Features

Flivver Plane Totes Guns, Bombs.....102
Germans Build Luxury Light Car.....118
Champion Hot Rod Hits 230 M.P.H. 120
New Rifle Trigger Cuts Vibration.....127
Private Railroad Rivals Big Lines.....130
Is Russia Building These Speedsters?....140
He Shoots Houses Out of a Gun.....145
How a Thermostat Tends Your Furnace 148
Antique Toys Still Delight the Kids.....158
Gas Pipe Taps Undersea Well.....165
Pilotless Bomber Can Carry A-Bomb.....168
Parking Meters Yield $50,000,000.....170
An Engine to Dream About.....193

Mechanics & Handicraft

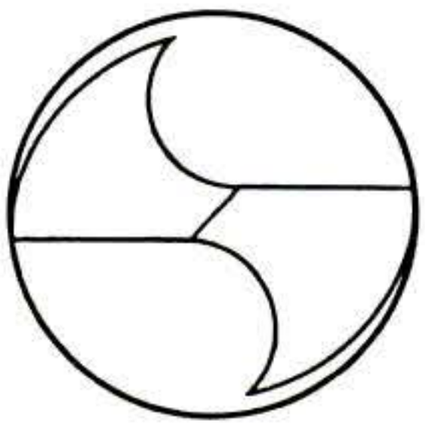
Carved Stool Needs No Carving Skill....185
From Packing Box to Sewing Cabinet....187
Winter Motoring Tips.....195
A Sports Car for Christmas?.....206
How to Stop TV Interference.....210
One-Evening Shop Projects.....212
Have You Tried a Fruit-Juice Can?.....220
Get Bargains from a House Wrecker....230
Slicked-Up Tools Work Better.....237
Guarding Against Roof Ice Dams.....239

Departments

Letters..... 10
Know Your Weapons.....111
New Ideas from the Inventors.....133
Aids to Modern Living.....142
Keeping the Home Shipshape.....151
I'd Like to See Them Make.....160
P. S. Last Minute News and Notes.....176
Hints from the Model Garage.....199
Craftsmen at Work.....205
New Tools 225
New Shop Ideas.....228

NEXT MONTH . . .

Taking the Mystery Out of Drills



Here is the business end of a twist drill. If you have business with drills—and what craftsman hasn't?—you'll want to read a special article in the December issue. Besides lots of tips on drilling, the how and why of carbon versus high-speed, and what to do about the hole that starts in the wrong place, it gives down-to-earth instructions on sharpening drills all the way to No. 60.

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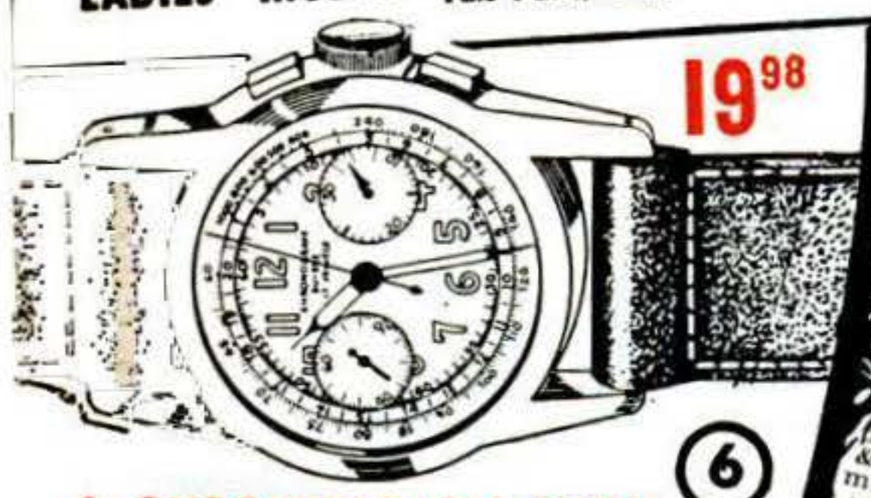

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jewels! Chromed case. Luminous dial. 30 min-, 60 second recorders. Sweep second hand. Tele-ter and tachymeter markings. Luminous num-ls and hands. Made in Switzerland. Sold for ch more elsewhere. Not Incabloc or waterproof, t with care it should give years of service. paid.....21.98

(7)

Low Cost 3 DIALS!

CHRONOGRAPH

NOW—at low cost—a chronograph wrist watch that measures speed, time and even distances of autos, airplanes, horse races, sports, lab and photo work, etc. **FEATURES:** A dependable wrist watch—luminous hands & numbers—Sweep Second hand—45 minute dial—6 hour dial—records minutes, hours, seconds. **2 INDEPENDENT MOVEMENTS.** Watch continues running while using stop-chronograph feature. Rugged construction withstands hard usage. Compare with other low cost chronographs selling for **$19.95.** Our cash price only 7.85 plus 79c tax, total—**8.64.**

Give Thoresen's Titania Rutile

. . . the wonder gem of science . . .

(8)

***More Brilliant than* DIAMONDS**

This Christmas give Thoresen's Titania Rutile Stones—the **wonder Gem** of Science! **Readers Digest, The Saturday Evening Post** and leading magazines has praised the sensational **AMERICAN DISCOVERY** of this laboratory-made gem that is actually **MORE BRILLIANT THAN DIAMONDS!** Now Thoresen brings it to you, in cut stones of one to five carats at less than **5%** of the cost of **African DIAMONDS!** Yet it takes a **JEWELER** or **DIAMOND SPECIALIST** to tell the difference! In fact, **PAWN BROKERS** are warned against the possibility of making big loans on **RUTILE,** thinking they are lending on **DIAMONDS!** It's easy, even for an expert, to make this mistake, because Rutile has a refractive index approximately **10% HIGHER** than Diamonds and a far **GREATER** dispersion index than **DIAMONDS!** It's no wonder that thousands of folks now prefer rutile to diamonds! They enjoy terrific prestige, admiration and perhaps envy associated with precious jewelry and don't have to pay out hundreds or thousands of dollars.

ONLY $10.00 PER CARAT!

We sell you the Stones in the size or shape you desire at only **$10.00,** plus **$2.00** federal tax per carat! Thoresen's Titania Rutile comes in **1, 2, 3, 4, 5** carats in **ROUND BRILLIANT, OBLONG EMERALD** or **OBLONG MARQUISE shapes.** For your greater satisfaction we ask you to have your jeweler mount it in your old or a new setting of your choice, thus **SAVING THE DIFFERENCE.** Each stone is gift packaged and is accompanied by **DESCRIPTIVE HINTS** for mounting it **YOURSELF** in old settings or hand made jewelry! **ATTENTION Jewelers, Pawnbrokers, Diamond Dealers:** Order samples of these stones to **AVOID DECEPTION** as well as for setting in men's and ladies' rings at high profits.

ORDER YOURS NOW ON APPROVAL

Compare with select diamonds! Show your trusted jeweler, then, if not delighted, return within 10 days for quick refund. Thoresen's Titania Rutile gems are well made, fiery, brilliant—yet our price is only **$12.00** per carat, tax paid! Mention carat size and shape when ordering! **Act now!**

Send No Money!

(9)

Recipro-Register SPLIT-SECOND WRIST WATCH & CHRONOGRAPH

The wonder 4 in 1 watch

The **ONE** and **ONLY** genuine Recipro-Register **CHRONOGRAPH**—computes speeds and distances down to 1/5 of second! **INCABLOC** 17 Jewel Movement resists shocks of work and play. Remembers for you while movement continues to keep time! **TIMES: Races, Planes, Sports, Photography, Shop Work, Lab Experiments, Lightning, etc. AUTOMATICALLY!** 3 multi-function synchronized dials. Contact clutch starts computation. Brake clutch freezes result. Also **ERASES** back to zero. Radium dial, hairline sweep second, all stainless steel back, unbreakable **Kleersite** crystal. Don't confuse with cheap, troublesome chronographs. Remember: Recipro Register is **INCABLOC** equipped for **ENDURING** performance. **Get the one and only genuine.** Compare for precision with watches selling to **$100.** Our low credit price—$59.95. **You SAVE ½ the Thoresen Cash-Save Way**—only $27.25 plus 10%, total **$29.98.** GIVEN: Reg. **$4.95** Cobra Metal Band.

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... YOU SAVE 50% THORESEN'S CASH SAVEWAY

THORESEN'S Famous Guarantee gives you DOUBLE protection!

Save with safety—the Thoresen **"DOUBLE" GUARANTEE** way. **1.**—Try at **OUR** risk . . . test, compare, appraise, judge for yourself. Your purchase price back—**and pronto**—if not delighted. No risk or obligation for you! **2.—UNLIMITED SERVICE GUARANTEE** exclusive of parts on all Thoresen watches. Repairs, if ever needed, made absolutely **FREE.** Never a charge for skilled labor, handling, adjusting, etc. This service cheerfully given you for the **LIFETIME** of this business! **BEWARE** of unscrupulous operators offering "redeemed" **second hand** watches. All Thoresen watches certified **brand new** and fully tested before shipment. **Rely on Thoresen's—the house that makes lifetime friends! Address: THORESEN DIRECT SALES, Dept. 7-N. 131 W. 33rd St., New York 1. N. Y.**

AMERICA'S GREAT POWER TOOL BUY!

38 Piece HI-POWER ELECTRIC TOOL KIT!

The ultra-powerful tool of 1000 uses

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- **DRILLS!** Up to 1/4 inch! Wood, Metal, Plastics!
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- **MIXES ANYTHING!** Paints, Enamels, All Liquids
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NOW yours at a "give-away" price—one of the most powerful and versatile electric hand and bench tool kits ever developed! Nothing left out! No expense spared! Includes famous "Hi-Power" 1/4" Portable Electric Drill, polished chrome finish with high speed air-cooled motor, auxiliary handle, automatic release trigger in handle, 7 high speed drill bits, polishing, sanding and grinding attachments, etc., etc. **GIVEN:** Steel bench stand and heavy gauge, custom-built steel case. Not just another drill, but a rugged power plant, built for years of satisfying service, driven by a genuine **HIGH TORQUE AC-DC** motor! All **38** pieces yours at one low price—**18.95.**

Gifts for the Workshop and Home

(11) **$7.98**

Palomino Horse Clock Artistic Triumph!

The gift that's sure to please! The **PALOMINO**—monarch of thorobreds . . . is here detailed elaborately, with exquisite artistic taste in sturdy Bronze color metal. Wins everyone's admiration! The horse surmounts an accurate, dependable 30 hour clock. Utility and decorative art combine to make this an ideal gift. Factory guaranteed! Thoresen brings it to you at an amazingly **LOW** price—only 7.95 plus 80c tax, total—**$8.75.**

(12) **POWERFUL LONG RANGE**

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Made in U. S. Zone GERMANY

AMAZING VALUE! Compare with domestic binoculars selling up to $9.95, for clarity, light weight, rugged construction! **GERMAN KLAROVIS** ground lenses give terrific magnification, wide field of view, and sharp, brilliant detail! Smooth, SYNCHRONOUS centre focusing mechanism. 40mm. objectives. **NEW!** Different! **CAUTION:** Do not confuse with crudely made binoculars claiming 18 mile ranges! You can depend on **GUARANTEED KLAROVIS QUALITY!** Manufactured by German Artisans. Only **$2.95.**

Try at our risk!

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Leopard Design AUTO SEAT COVER

WATERPROOF! STAIN RESIST! TOUGH, LONG WEAR PLASTIC

Fit any car, any year, any model. Easy to install! No pins needed. Choice of covers for front or rear seat at only $2.95—or set of 2 for both front and back seats for only $4.95. These guaranteed seat covers are made to rigid Thoresen Specifications to give you utmost satisfaction and enduring service. Mention car model, year, make and if full front or split front seats.

(14) **$2.39**

Imported Quality

A delightful, thoughtful gift that spreads Christmas Cheer the year round! "Aladdin's Lamp" lighter and the beautifully embossed tray are richly Silver plated. Lighter is press-lever automatic type that gives instant flame. Thoresen's Special Price direct-to-you **$2.39**

Remember your car for Xmas! **$10**

(15)

NEW! Laboratory Tested! Heavy Duty!

PORTABLE GARAGE

The ideal garage—it travels with your car—resists the ravages of snow, sleet, rain, sun, salt air, etc. Whisks on and off quick and easy. Folds away like a handkerchief. Takes little storage space. SURE-GRIP elasticized bottom offers complete security winter or summer. **Pays for itself many times over.**

Compare with **ANY** $19.95 Garage

Do not confuse with inferior materials. Thoresen's is **QUALITY** made of **100% HEAVY DUTY TRANS-KLEER**—the miracle Vinyl. Laboratory tested: Resists cracking . . . peeling . . . Drying. Our price, only **$10.**

Mention car make, year & model.

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RUSH items checked by numbers below **ON APPROVAL for 10 days,** together with watch Service Guarantee, gift box and **CHRISTMAS GIFT.** If not delighted you are to return **full purchase price** at once. Christmas delivery guaranteed. **Check number of merchandise desired.**

Remittance enclosed. Send prepaid ☐ Send COD plus postage ☐

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OF EXTRA COST

Thoresen's **Christmas Gift to You!**

In the spirit of Christmas, Thoresen has prepared thousands upon thousands of gifts for its customers, such as: **Jewelry, Watches, Gadgets, Novelties Galore**—Some worth up to **$10.00.** To get yours, simply tear out and mail **this** coupon with your order! First come, first served. Your surprise gift is yours to **KEEP** whether you return your purchase or not! It's Thoresen's way of saying: **"Thank you for your confidence and Merry Christmas to you!"**

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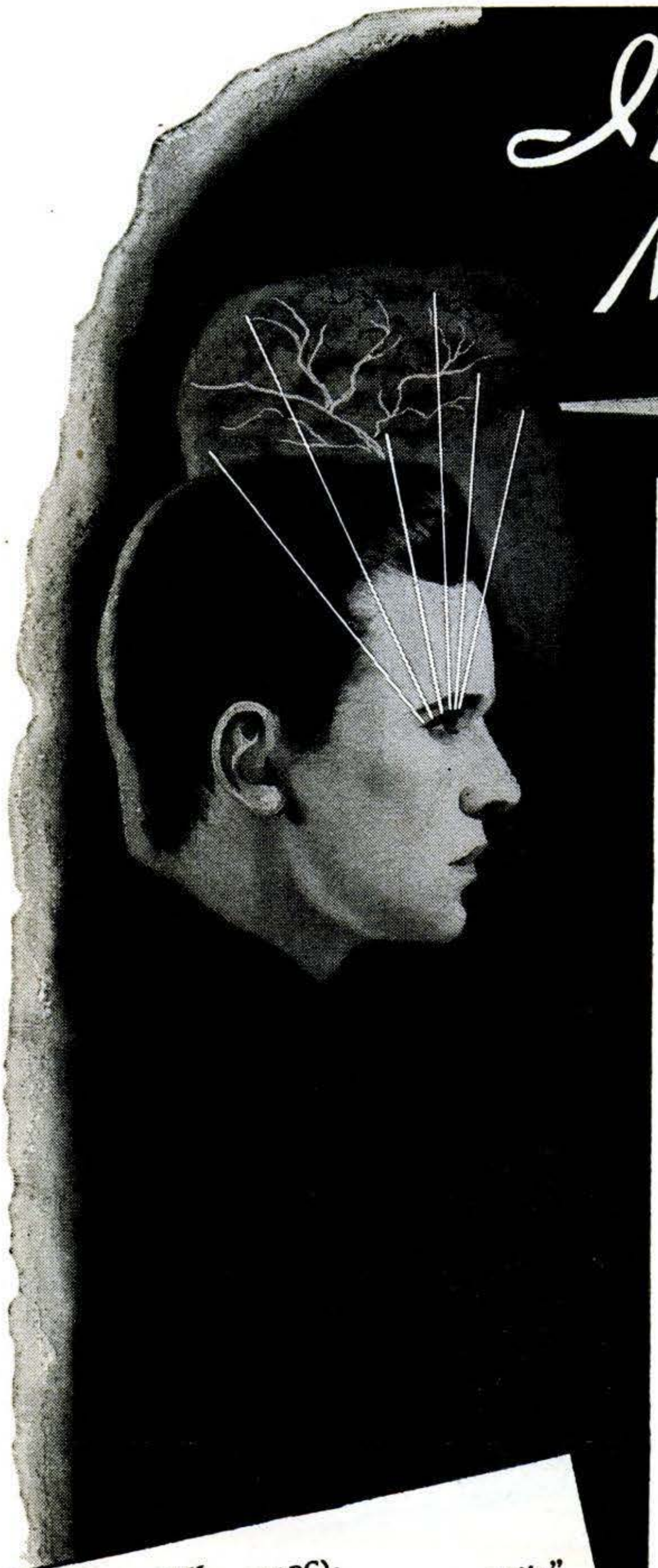
In Your Mind's Eye



The Secret of MENTAL CREATING

IF you just like to dream, read no further. There comes a time when your fancies *must be* brought into light—and stand the test of every-day, hard realities. Are you one of the thousands—perhaps millions—whose thoughts never get beyond the stage of *wistful wishing?* Do you often come to from a daydream with the sigh, "If only I could bring it about—*make it real?*"

All things begin with thought—it is what follows that may take your life out of the class of those who hope and dream. Thought energy, like anything else, can be dissipated—or it can be made to produce actual effects. *If you know how to place your thoughts* you can stimulate the creative processes within your mind—through them you can assemble things and conditions of your world into a happy life of accomplishment. *Mental creating* does not depend upon a magical process. It consists of *knowing how* to marshal your thoughts into a power that draws, compels and organizes your experiences into a worth-while design of living.

ACCEPT THIS *Free* BOOK

Let the Rosicrucians tell you how you may accomplish these things. The Rosicrucians (not a religious organization), a world-wide philosophical fraternity, have preserved for centuries the ancients' masterful knowledge of the functioning of the inner mind of man. They have taught men and women how to use this knowledge to *recreate their lives.* They offer you a free copy of the fascinating book, "The Mastery of Life." It tells how you may receive this information for study and use. Use coupon opposite.

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Please send free copy of "The Mastery of Life," and I shall read it as directed.

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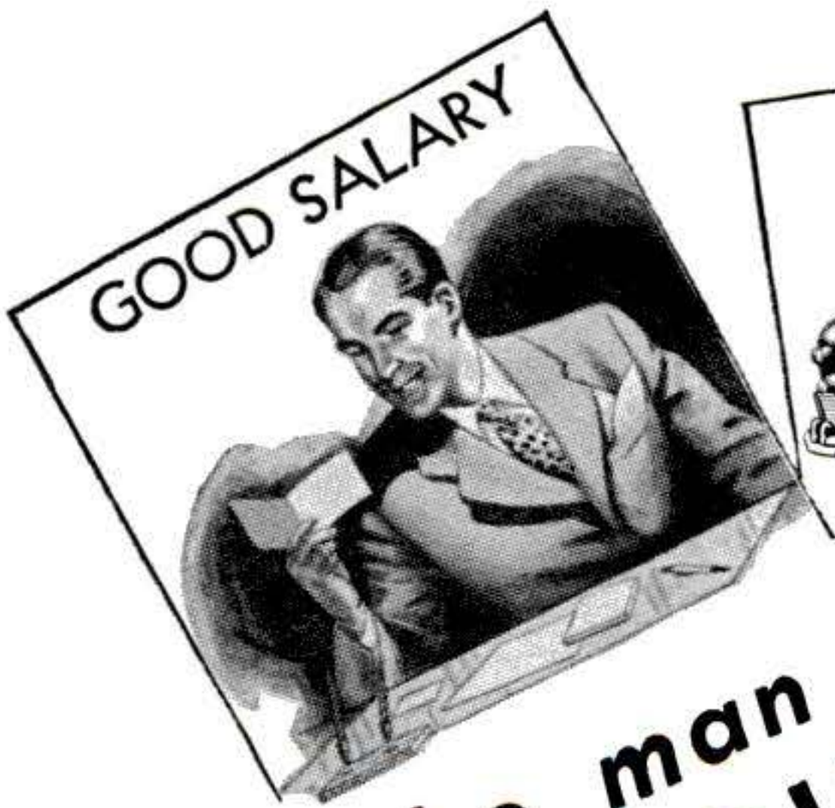
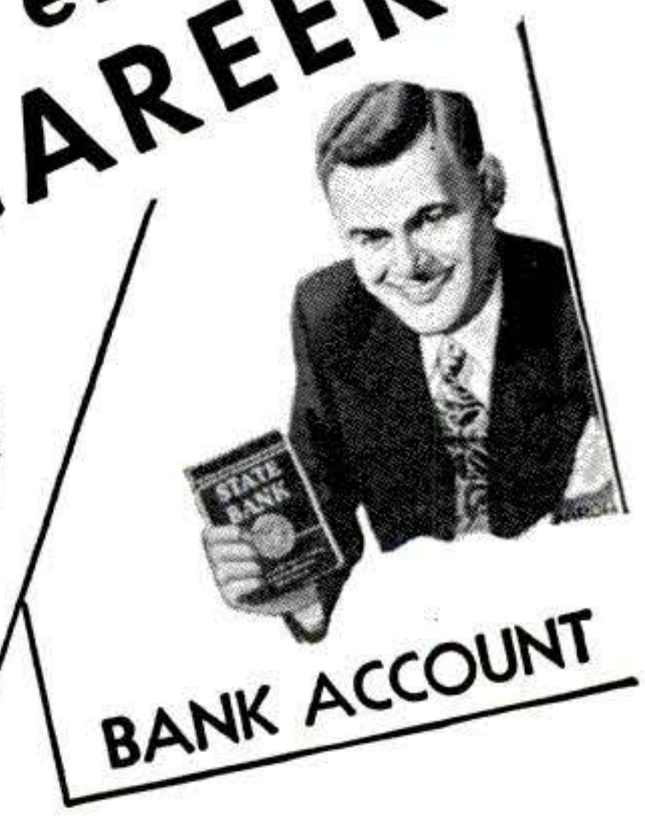


To the man who wants to enjoy an ACCOUNTANT'S CAREER



IF you're that man, here's something that will interest you.

Not a magic formula—not a get-rich-quick scheme—but something more substantial, more practical.

Of course, you need something more than just the desire to be an accountant. You've got to pay the price—be willing to study earnestly, thoroughly.

Still, wouldn't it be worth your while to sacrifice some of your leisure in favor of interesting home study—over a comparatively brief period? Always provided that the rewards were good—a salary of $4,000 to $10,000?

An accountant's duties are interesting, varied and of real worth to his employers. He has *standing!*

Do you feel that such things aren't for you? Well, don't be too sure. Very possibly they *can* be!

Why not, like so many before you, investigate LaSalle's modern Problem Method of training for an accountancy position?

Just suppose you were permitted to work in a large accounting house under the personal supervision of an expert accountant. Suppose, with his aid, you studied accounting principles and solved problems day by day—easy ones at first—then more difficult ones. If you could do this—and could turn to him for advice as the problems became complex — soon you'd master them all.

That's the training you follow in principle under the LaSalle Problem Method.

Over 3500 Certified Public Accountants among LaSalle alumni

You cover accountancy from the basic Principles right up through Accountancy Systems and Income Tax Procedure. Then you add C. P. A. Training and prepare for the C. P. A. examinations.

As you go along, you absorb the principles of Auditing, Cost Accounting, Business Law, Statistical Control, Organization, Management and Finance.

Your progress is as speedy as you care to make it—depending on your own eagerness to learn and the time you spend in study.

Will recognition come? The only answer, as you know, is that success *does* come to the man who is really *trained*. It's possible your employers will notice your improvement in a very few weeks or months. Indeed, many LaSalle graduates have paid for their training—with increased earnings—before they have completed it! For accountants, who are trained in organization and management, are the executives of the future.

Write For This Free Book

For your own good, don't put off investigation of *all* the facts. Write for our free 48-page book, "Accountancy, The Profession That Pays." It'll prove that accountancy offers brilliant futures to those who aren't afraid of serious home study. We'll also include "Ten Years' Promotion in One"—a book which has helped many men. Send us the coupon *now*.

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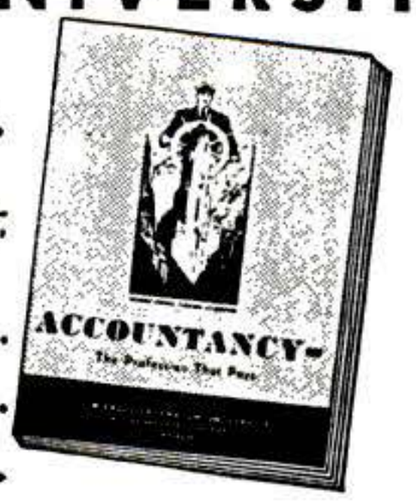

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Letters

Clocking the Iron Horses

The August article "Highballing the World's Fastest Trains" [p. 79] mentioned three fast trains—two of Burlington's and one of Illinois Central's. It says that only these three go faster than 80 m.p.h. However, on the Chicago & North Western there is a streamliner—the "400"—that goes from Chicago to St. Paul, by way of Adams and Milwaukee. They have a speedometer on it that has gone well above 90 m.p.h.! They average three hours from Chicago to Adams (about 250 miles) and about three more from Adams to St. Paul (about 220 miles).

RALPH E. MAAS, Chicago

Our article evaluated train speeds in terms of averages. The Chicago & North Western's fastest train is the Commuter-Streamliner-Valley 400, which averages 78.3 m.p.h. between Kenosha and Waukegan.

Blow the Frost Down

On page 181 of your August issue, E. F. Lindsley suggests using the vacuum hose, attached to the blower end of the vacuum

cleaner, to speed defrosting the refrigerator. Since this hose is regularly used to suck dust from floors, it does not seem very sanitary to employ near food.

A better method would be to use a common, small electric hair dryer. Besides being cleaner and more compact, the warm air flow would do a quicker job of defrosting.

WALTER SCHMAND, Brooklyn, N. Y.

Brazilian Rope Trick

The same rope-pump device which the professors found so intriguing ["Rope Lifts Water Without a Bucket," PS, June '51, p. 77] is in general use throughout Brazil, using link-chain instead of rope, and frequently a geared hand-wheel instead of an electric motor.

STANLEY I. RATNER, Sao Paulo, Brazil

The Moose Is Mightier Than the Motor

The letter on "Signs" in your August issue reminded me of one I saw last summer while traveling through Maine. It definitely

told me I was no longer in the area of the cities I am used to. It read, "Danger, Moose Crossing!"

CYRIL KEENE, JR., Baltimore

Muntz Had Both Engines

In the article "Shaw Compares 3 Sports Cars" in the September, 1951, issue on page 87, Mr. Shaw states that he would like to see what the Muntz Road Jet would do with an overhead-valve engine.

But the November, 1950, issue of *Motor Trend* clearly shows a Muntz with a Cadillac overhead-valve engine instead of the Lincoln L-head.

Which motor is the car really powered by?

GARY HILDING, Paola, Kan.

The Muntz was originally powered by a Cadillac engine, has since switched to a Lincoln.

L-Head vs. Overhead Valves

. . . Shaw stated that the Muntz engine was an L-head, "almost obsolescent in today's high-compression market."

How come Ford-built L-head V-8s won the 1950 and 1951 Mobilgas Economy Runs? How can the same engine that is in Muntz' car drive a 5,000-lb. Lincoln at nearly 100 miles an hour? How can that same Lincoln engine in an F-8 Ford truck haul 30-40 tons around for 100,000 miles without major overhaul? Is there any stock engine on the market today that is more reliable than Ford L-head V-8s?

EUGENE C. LAMB, DeWitt, N. Y.

We agree that the L-head is a fine engine. Mr. Shaw feels that the overhead-

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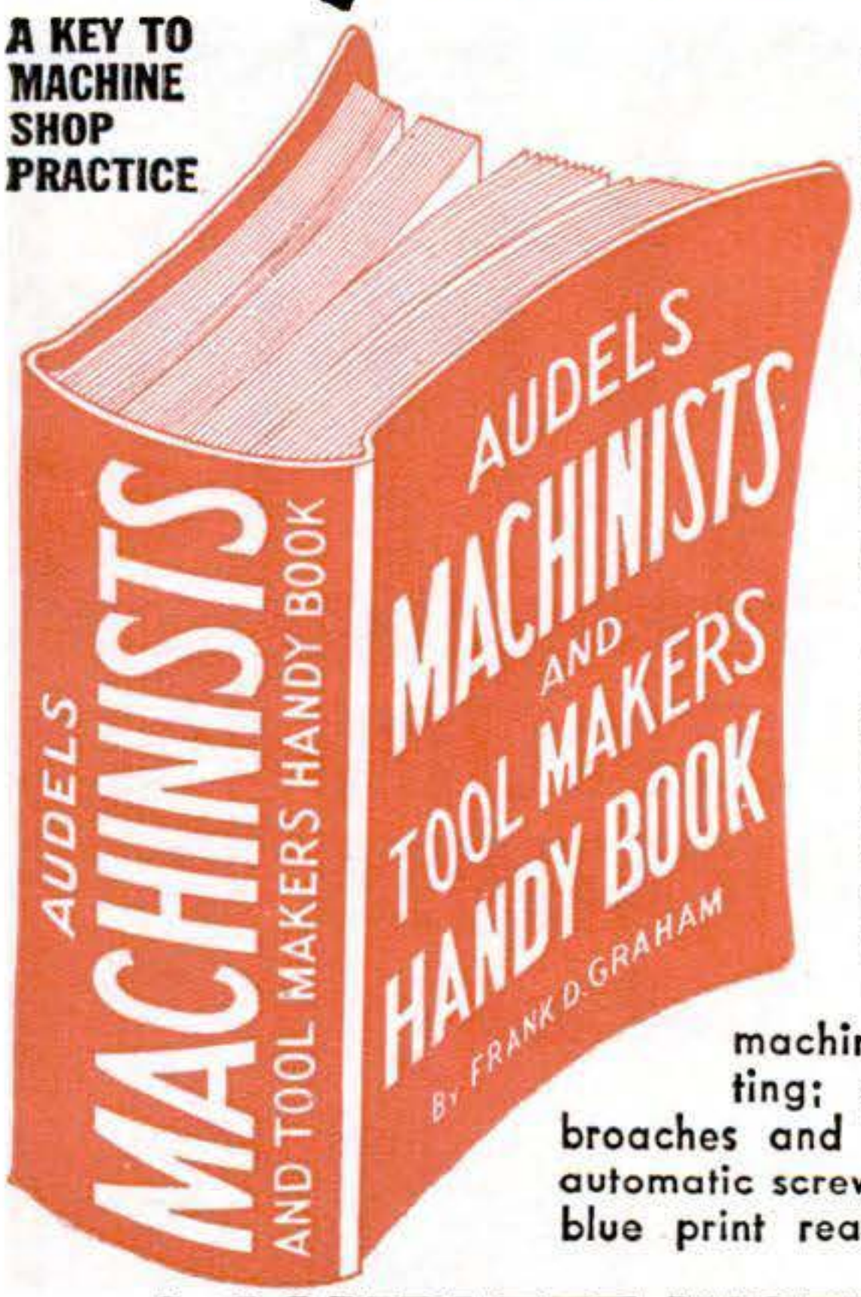
WHAT Every MACHINIST Wants to Know

A KEY TO MACHINE SHOP PRACTICE



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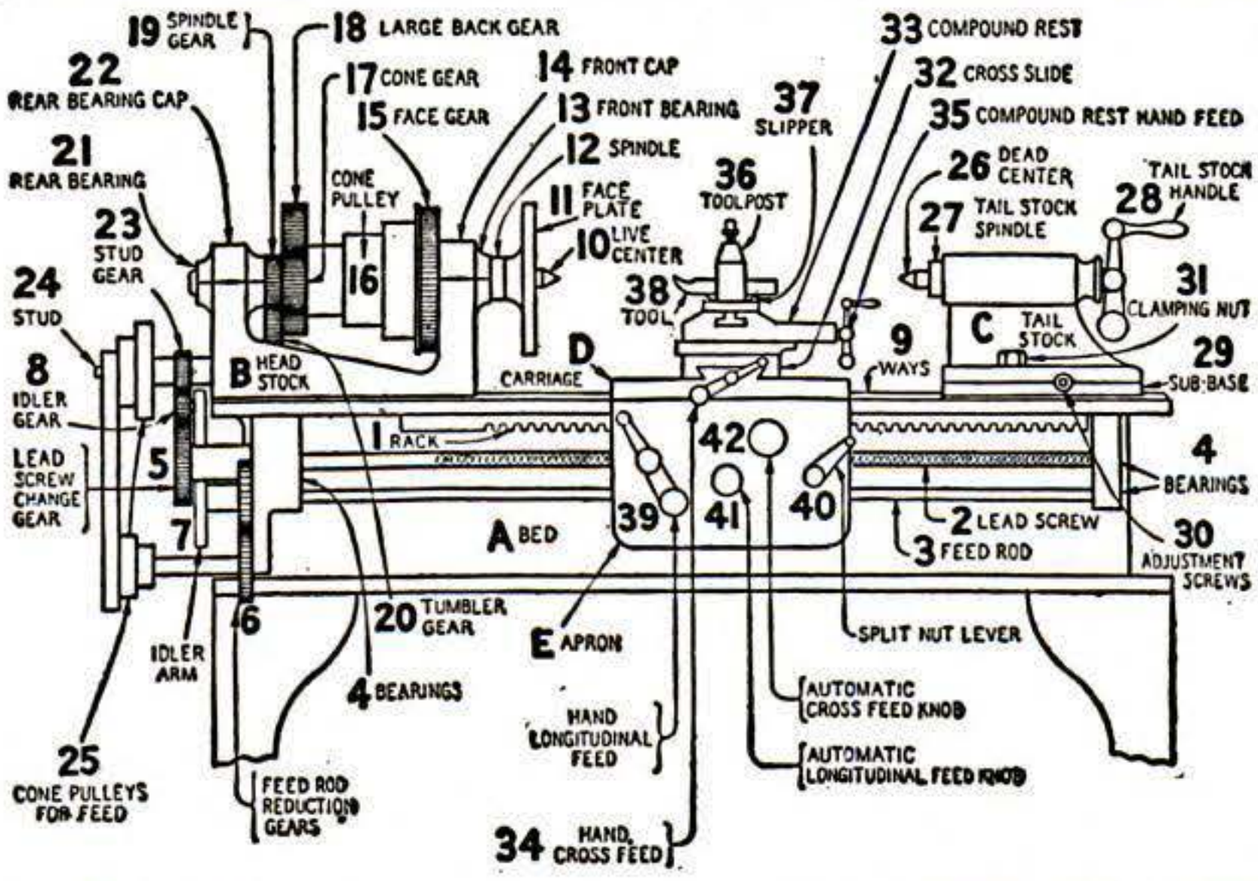

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I Trained These Men

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PHILLIP G. Louisville 8, K have been oper Servicing busi years I did $14 business; net p

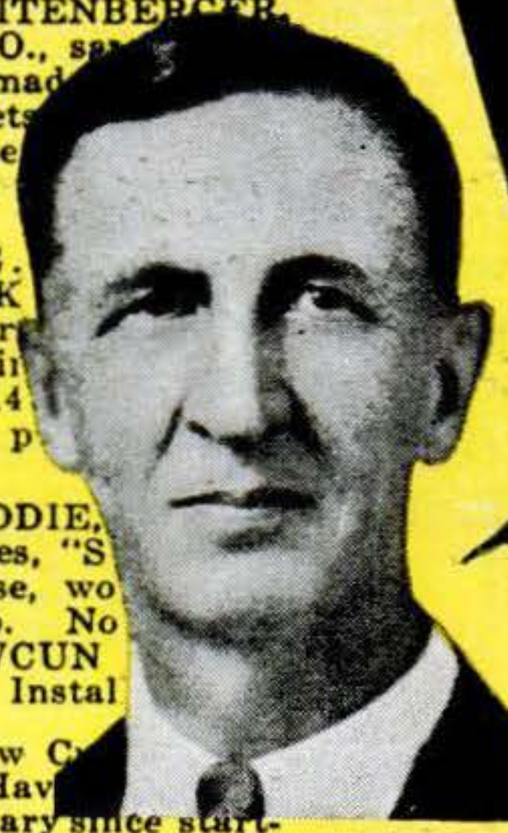
S. W. DINWIDDIE, ville, Ill., writes, "S finishing course, wo servicing shop. No Engineer of WCUN Police Radio Instal

A. HERR, New C Pa., writes, "Hav doubled my salary since start-ing in Radio full time. Am employed by Station WKBO as transmitter operator. Future looks bright to me."

L. HAUGER, San Bruno, Calif., tells us, "I accepted a position as Radio and Television Technician . . . promoted to manager of Television Service and Installation."

LEANDER ARNOLD, Pontiac, Mich., says, "While learning, made $5 to $10 a week repairing Radios in my spare time. Now I have a spare time shop in my home."

NORMAN H. WARD, Ridgefield Park, N. J., writes, "4 years ago, I was a bookkeeper with a hand-to-mouth salary. Now I am employed by a key ABC station."



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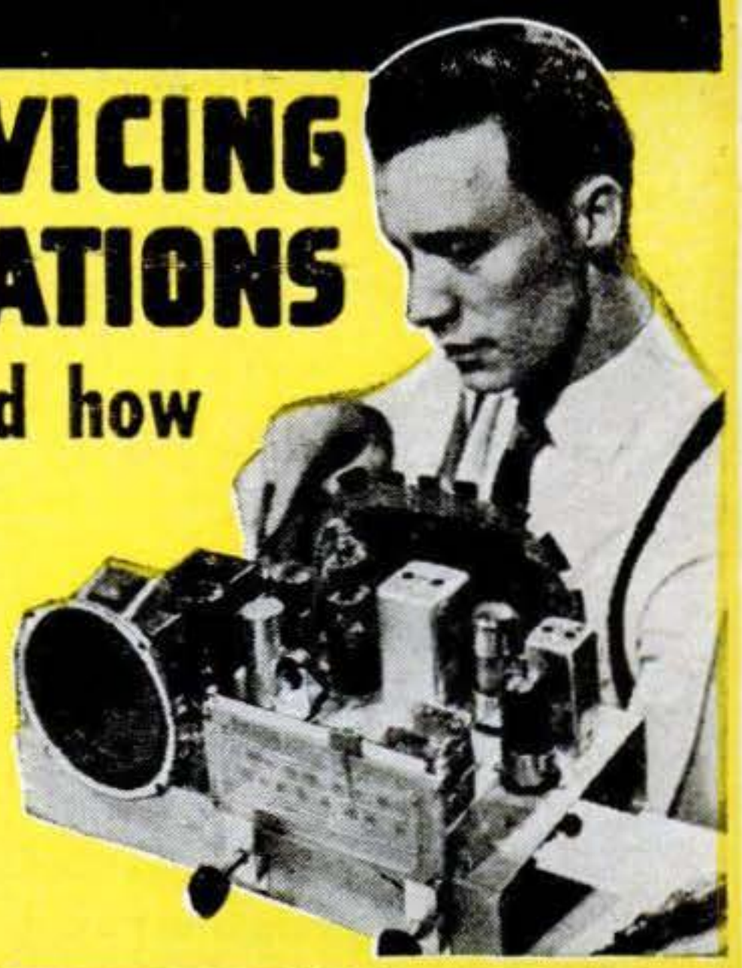


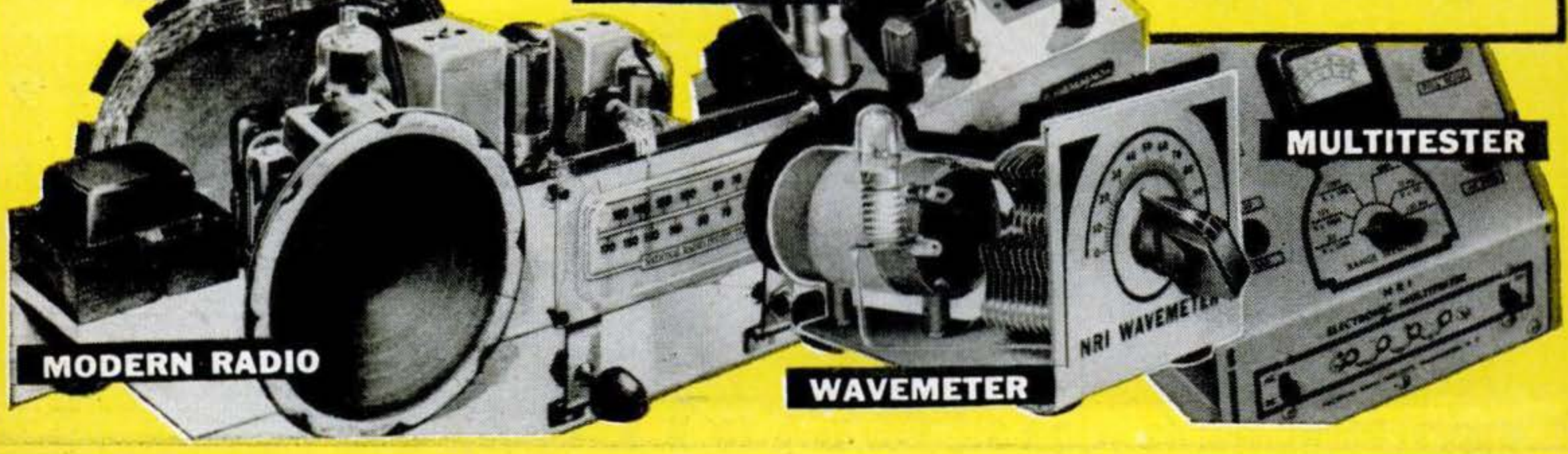
For both my Servicing Course and my Communications Course, I send you many Valuable Kits of Parts for PRACTICAL EXPERIENCE. They "bring to life" theory you learn in my illustrated texts. Some equipment from both courses is shown below. As part of my Servicing Course, you build a complete, powerful Radio Receiver, a Multitester useful in earning extra spare time money, an A.M. and F.M. Signal Generator, etc. In my Communications Course, you assemble a low-power Broadcasting Transmitter that shows how to put a station "on the air," a Wavemeter, and an Electronic Multitester for measuring voltage, current, resistance, impedance, etc. This and other equipment you build with Kits I send is yours to keep.

Make Extra Money in Spare Time While Learning

Many of my students earn money fixing neighbors' Radios in their spare time while learning, often average $5, $10, a week. I send you SPECIAL BOOKLETS that show you how to do it . . . and I send parts to build a Multitester that helps you do it.

NEW! Advanced Television Practice!

New, special TV kits furnished to build high-definition SCOPE . . . RF OSCILLATOR with flyback power supply . . . complete TV SET . . . many other units. You see pulse, trapezoidal, saw-tooth wave forms. Get valuable PRACTICAL EXPERIENCE locating and correcting TV troubles. Mail coupon for facts, pictures and prices!



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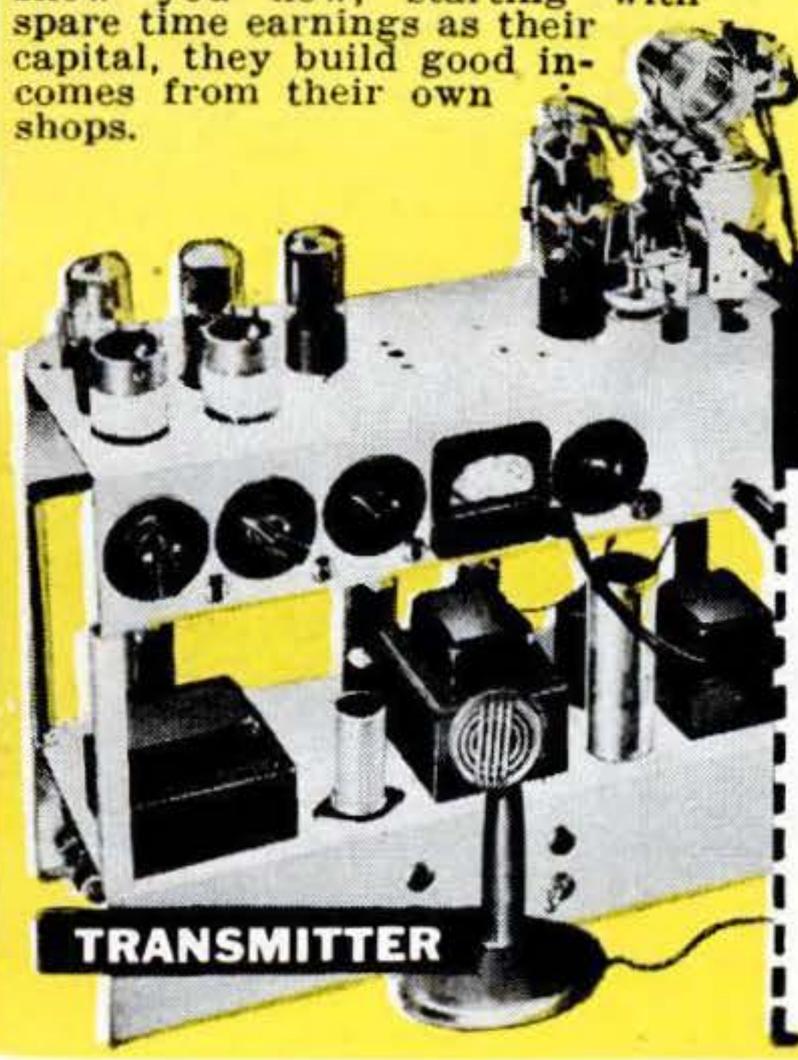
Knowing Radio, TV, Electronics can help you get extra rank, extra prestige, more interesting duty at pay up to several times a private's base pay. You are also prepared for good Radio-TV jobs upon leaving service. Mail coupon TODAY!

Want Your Own Business?

Many N.R.I.-trained men operate successful Radio-Television sales and service businesses. Let me show you how, starting with spare time earnings as their capital, they build good incomes from their own shops.



DO YOU want good pay, a job with a bright future and security? Would you like a profitable shop of your own? The fast growing, prosperous RADIO-TELEVISION industry is making these opportunities for you. Radio alone is bigger than ever. 90 million home and auto Radios, 3100 Broadcasting Stations, Two-Way Radio for buses, taxis, etc., are making opportunities for Servicing and Communications Technicians and FCC-Licensed Operators.

Television is TODAY'S Good Job Maker

In 1946 only 6,000 TV sets sold. In 1950 over 5,000,000. By 1954, 25,000,000 TV sets will be in use, according to estimates. Over 100 TV Stations are operating in 35 states. Authorities predict there will be 1,000 TV Stations. This means new jobs, more jobs, good pay for qualified men.

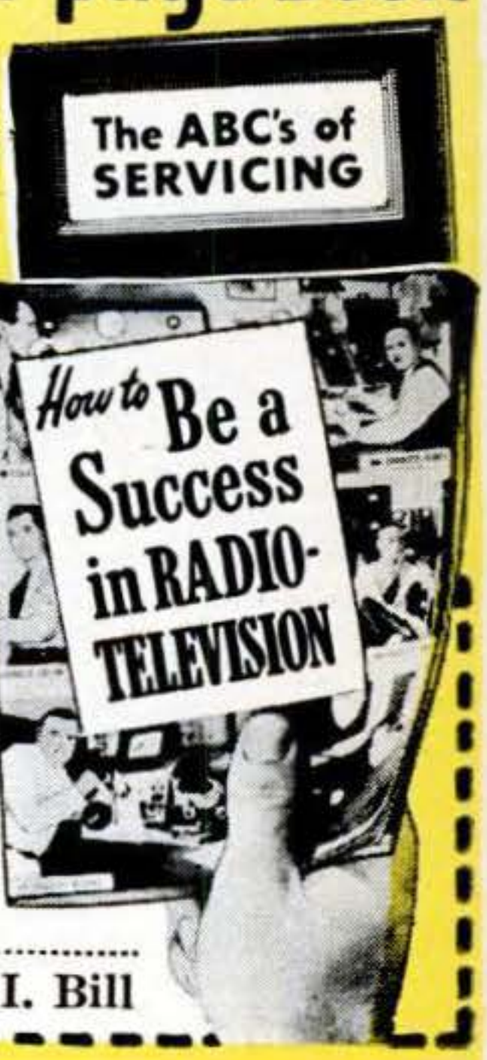
Many Soon Make $10 A Week Extra in Spare Time

Keep your job while training at home. Hundreds I've trained are successful RADIO-TELEVISION TECHNICIANS. Most had no previous experience; many no more than grammar school education. Learn Radio-Television principles from illustrated lessons. Get PRACTICAL EXPERIENCE. See on the opposite page some of the devices my students build from Kits of Parts I furnish; also practice servicing Radios or operating transmitters—experiment with circuits common to Radio and Television. You keep all equipment. Many students make $5, $10, a week extra fixing neighbors' Radios in spare time. SPECIAL BOOKLETS start teaching you the day you enroll.

Send Now for 2 Books FREE—Mail Coupon

Act Now! Send for my FREE DOUBLE OFFER. Coupon entitles you to Sample Lesson on Servicing; shows how you learn Radio-Television at home. You'll also receive my 64-page book, "How to Be A Success in Radio-Television." You'll read what my graduates are doing, earning; see photos of equipment you practice with at home. Send coupon in envelope or paste on postal. J. E. Smith, President, Dept. 1MB, National Radio Institute, Washington 9, D. C. OUR 38TH YEAR.

Actual Lesson and 64 page Book BOTH FREE



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MR. J. E. SMITH, President, Dept. 1MB
National Radio Institute, Washington 9, D. C.

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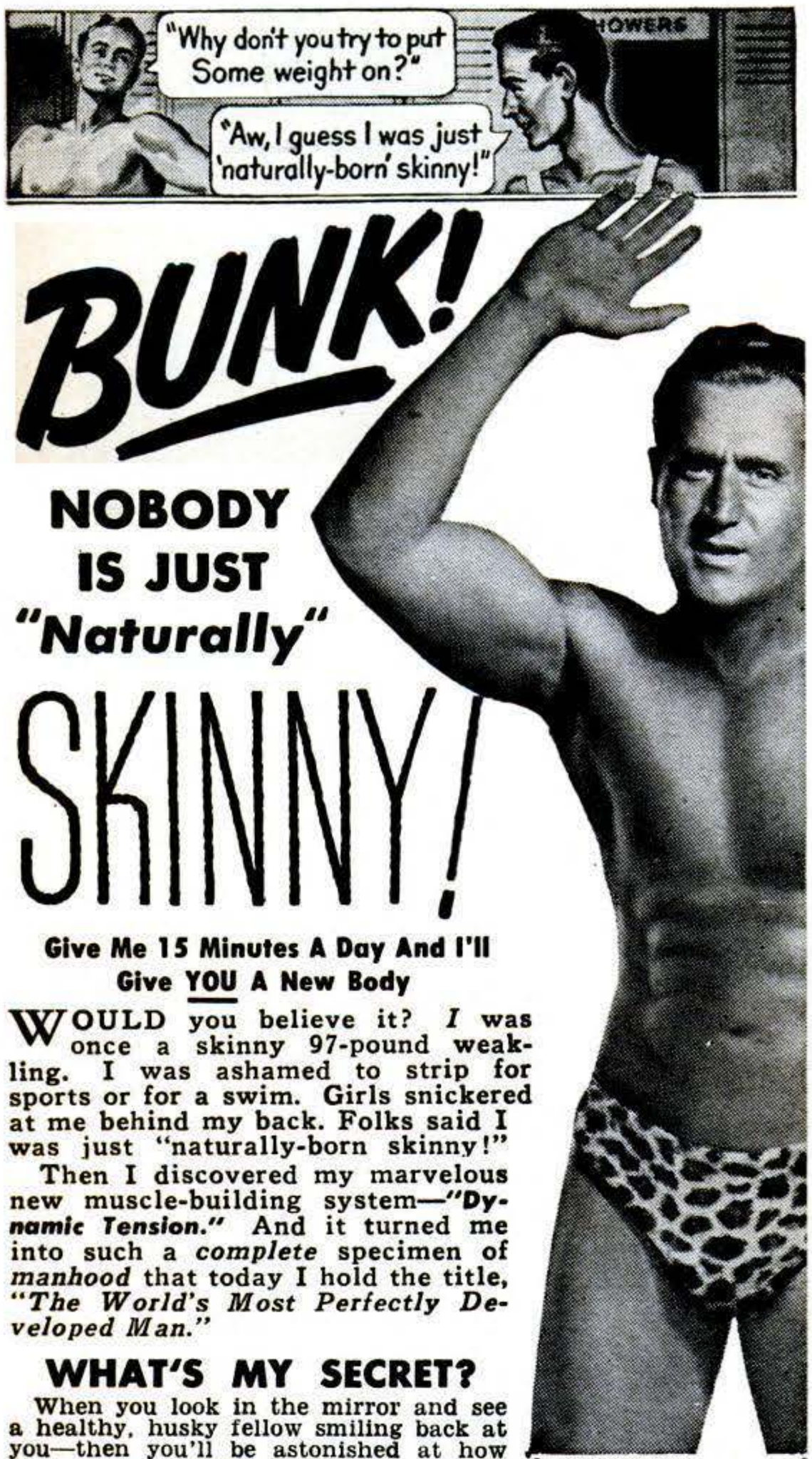

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WHAT'S MY SECRET?

When you look in the mirror and see a healthy, husky fellow smiling back at you—then you'll be astonished at how fast **"Dynamic Tension"** *gets results!* **And you'll** be using the method which many great athletes use for keeping in condition—prize fighters, wrestlers, baseball and football players, etc.

"Dynamic Tension" is the easy, *natural* method that you can practice in the privacy of your own room—*just 15 minutes each day*—while your scrawny chest and shoulder muscles begin to swell . . . those spindly arms and legs bulge . . . and your whole body starts to feel full of zip, self-confidence, new energy!

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valve engine is even better. The trend to overhead valves would seem to bear him out.

Jag Ambidextrous

The illustration of the Jaguar on your September cover and the photograph in the text did not coincide. The cover Jaguar was a right-hand drive, whereas the one in the text was a left-hand drive. Can the Jaguar be obtained with either the right- or left-hand drive, or was the illustrator at fault?

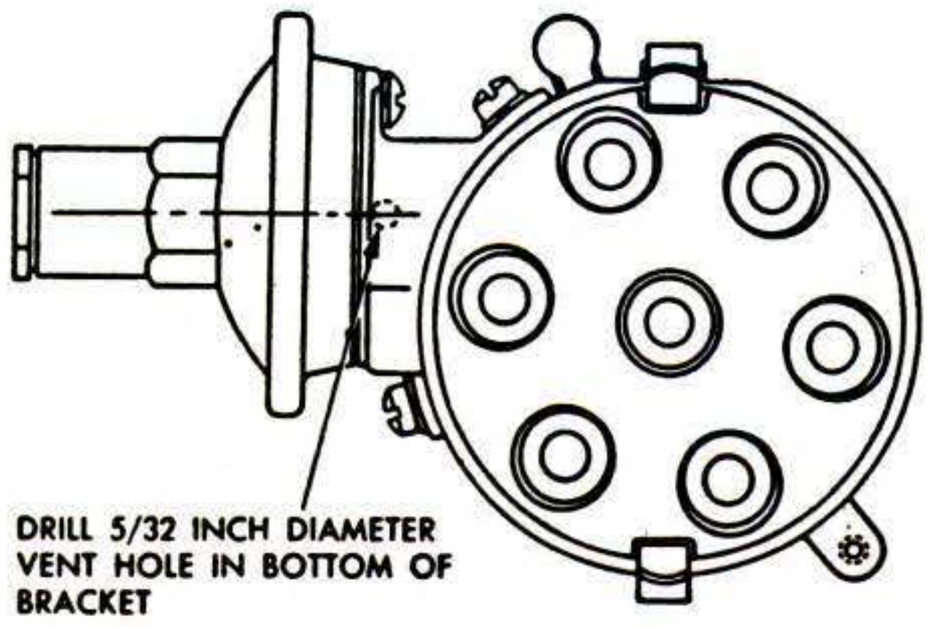
FRANK S. BEATTY, Denver

Although Jaguars are made in England, where everybody drives on the left, so many are now being exported to the U.S. (about 90 percent of present production) that nearly all have left-hand drive. Normally, you could get either drive, but if you want right-hand drive now, you have to put in a special order.

Dope on Distributor Caps

The former owner of my '49 Dodge tells me that he encountered the problem of a popping distributor cap, solved by Gus Wilson in your June issue. In the case of my car, however, the owner simply drilled a hole in the distributor cap to allow fuel vapor to escape—instead of installing a new vacuum unit as Gus did. Would it be best for me to replace my unit?

FRANCIS L. SAMHAMMER, Easton, Pa.



It would. The diaphragm in your vacuum chamber is undoubtedly punctured or the cap wouldn't have popped. Drilling the cap would let vapor escape, but the punctured diaphragm would keep manifold vacuum from retarding the spark when the engine is under load. Besides a new vacuum chamber, the Dodge people recommend drilling a 5/32" vent hole in the bottom of the distributor bracket *if there's not already one in that spot. See the sketch above.*

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INVENTORS

Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

A patent gives the inventor the exclusive right to prevent others from making, using, or selling the invention claimed in the patent for a period of seventeen years.

The Patent Laws were enacted for the benefit of the inventor to give him protection for the features of his invention which are patentable. These features must be properly and concisely set forth and claimed in a formal application for patent, in order to comply with the requirements of the Patent Laws. For that reason, unless the inventor is familiar with patent matters, he should engage a competent registered patent attorney or agent to represent him. We are registered to practice before the U. S. Patent Office and are prepared to serve you in the handling of your patent matters.

A specially prepared booklet entitled "Patent Guide for the Inventor", containing detailed information with respect to patent protection and procedure, together with a "Record of Invention" form will be promptly forwarded to you without obligation upon request.

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The firm of McMorrow, Berman & Davidson, with offices in Washington, D. C., is qualified to take the necessary steps for you. We can make a preliminary search on your invention, advise you whether we think it can be patented, and prepare your application for patent.

Unless you are fully familiar with the U. S. Patent Laws, we recommend that you engage the services of a Registered Patent Attorney to protect your interests. The patent laws are *your* laws. A patent gives you the right to prevent others from making, using or selling the invention claimed in your patent for a period of 17 years.

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Send for a copy of our Patent Booklet entitled "How To Protect Your Invention," containing information about patent protection and patent procedure. Along with this we will also send you an "Invention Record" form, for your use in writing down and sketching details of your invention. We will mail them promptly. No obligation. They are yours for the asking.

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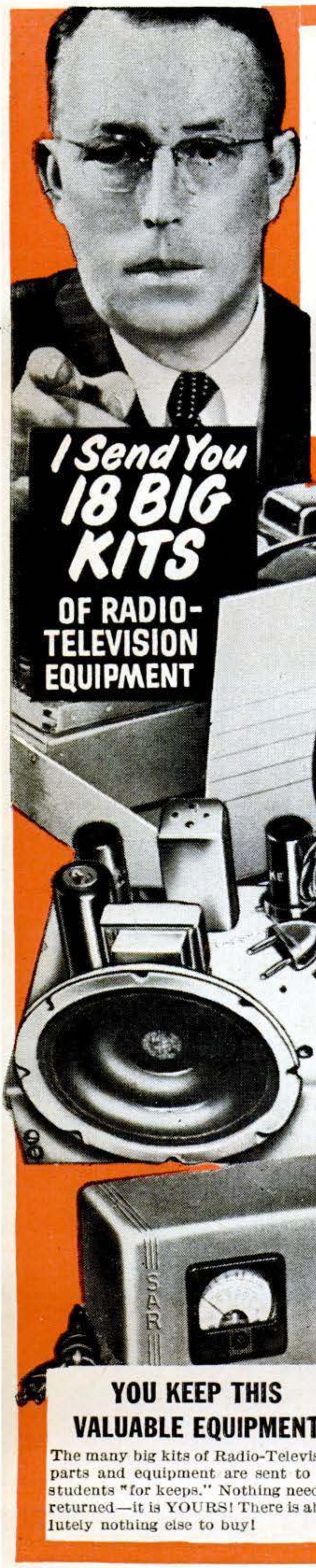

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"Got a job in local radio shop soon after enrolling. Very satisfied with training." — Stanley Clemmons, Kansas.

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"I have more than taken in the cost of your training doing spare time radio repair work. See bright future ahead."—Thomas Shearer, N. Y.

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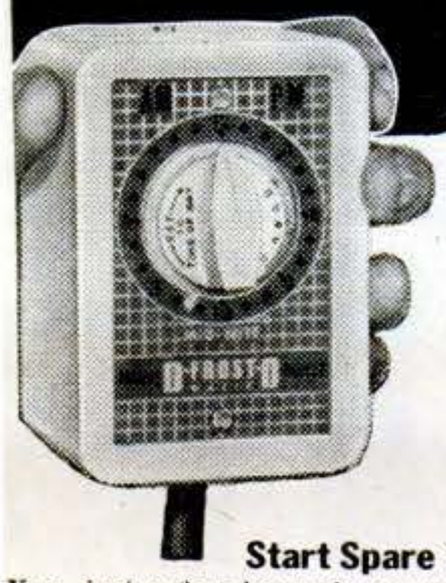

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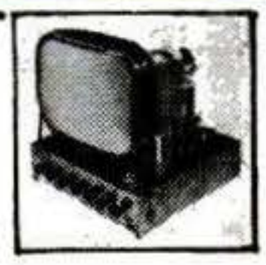

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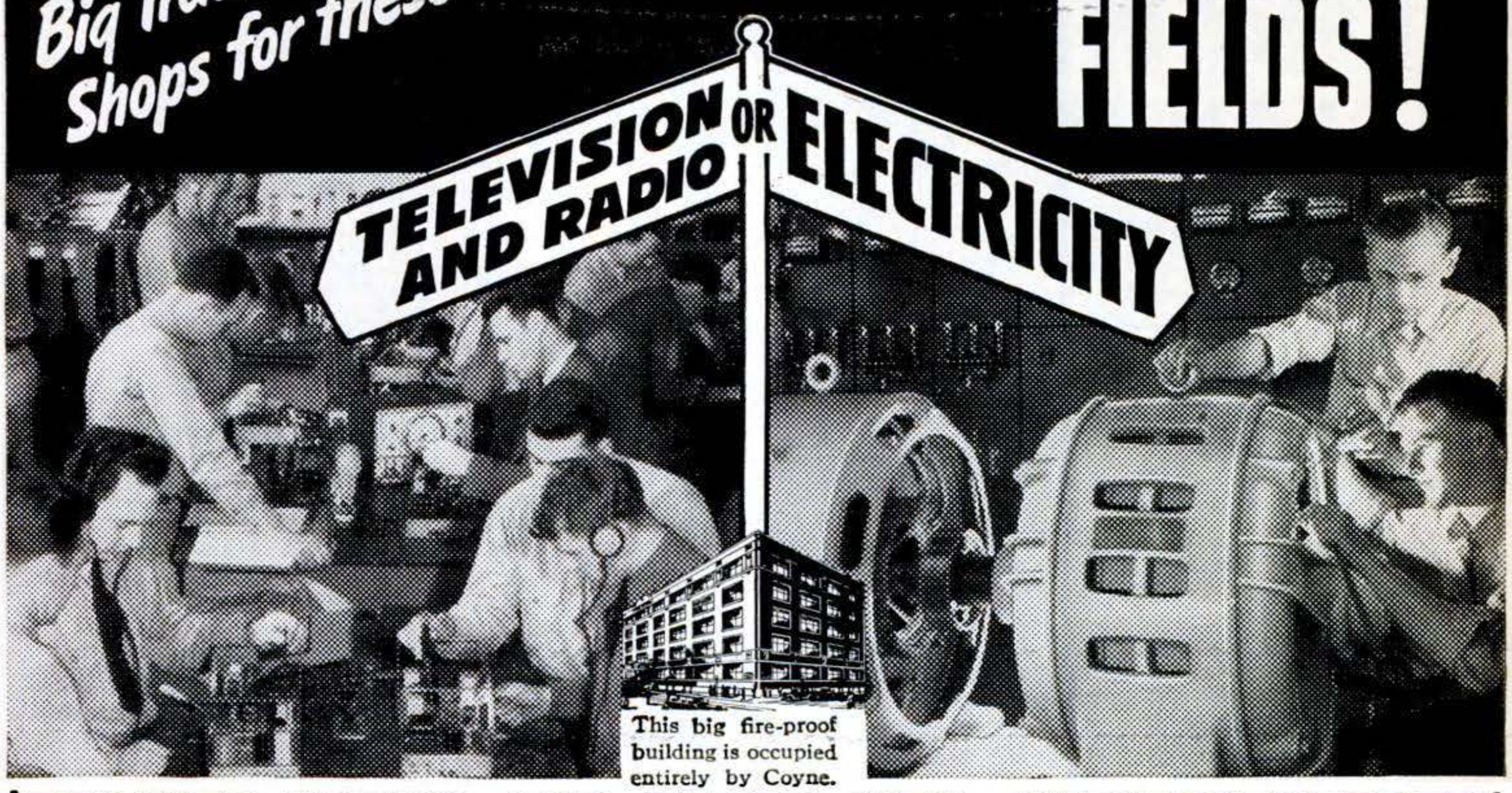

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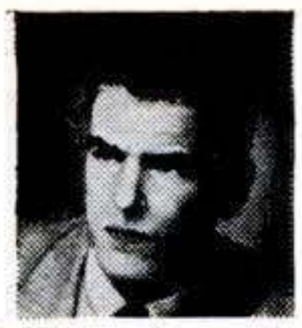

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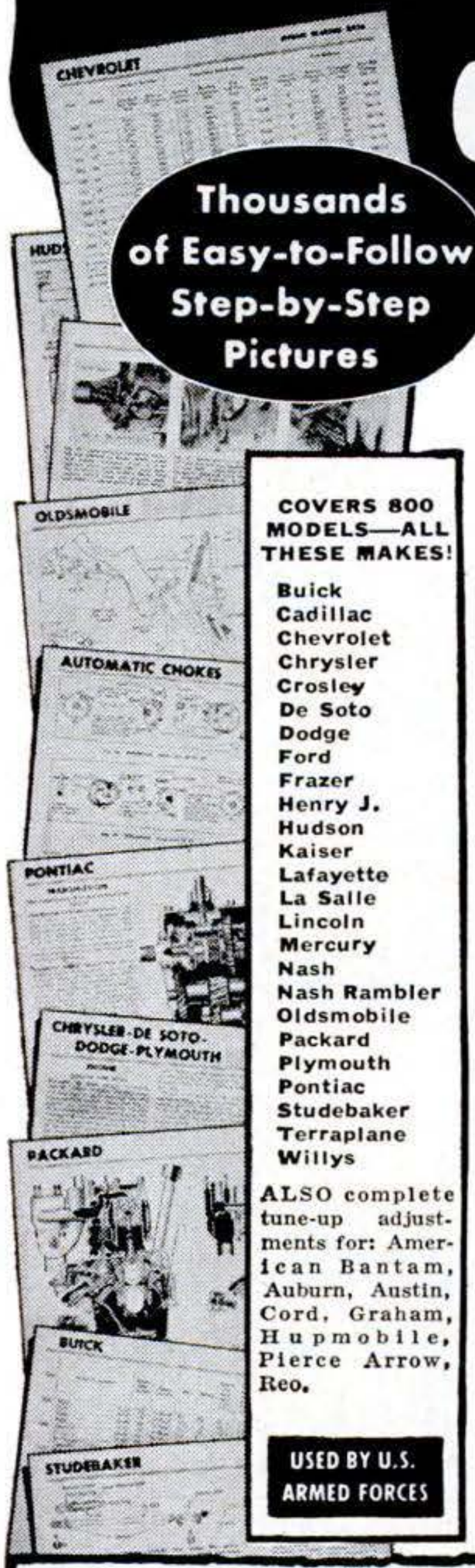

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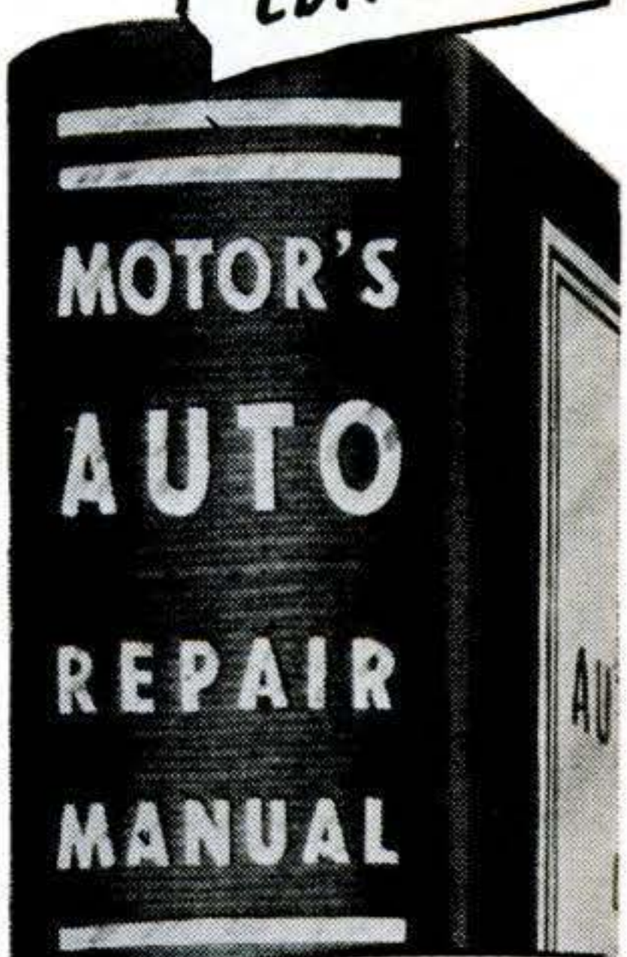

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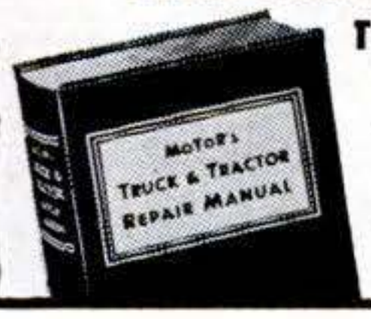

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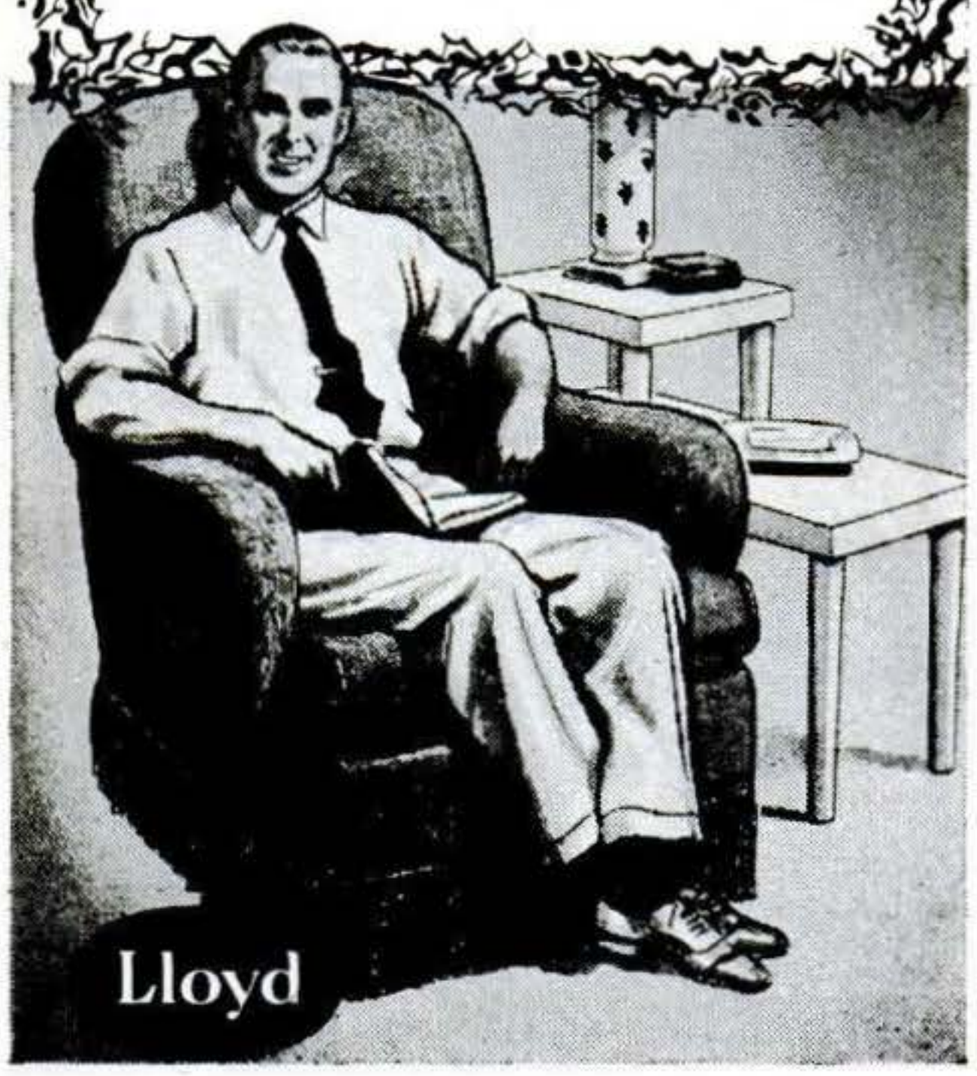

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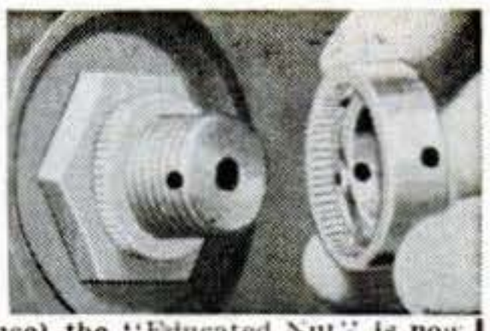

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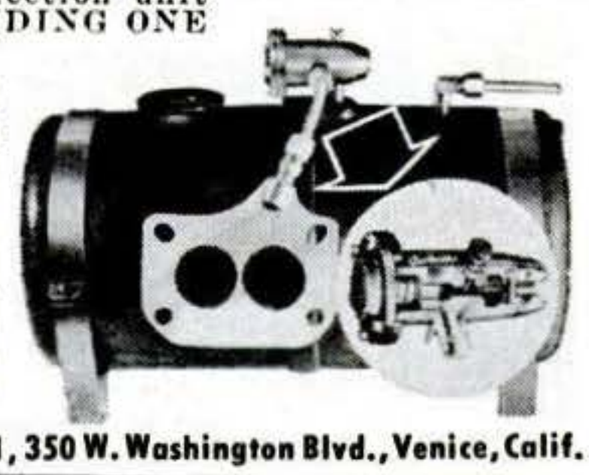

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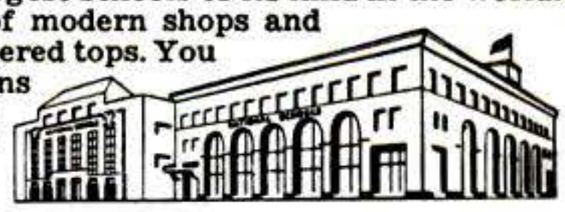

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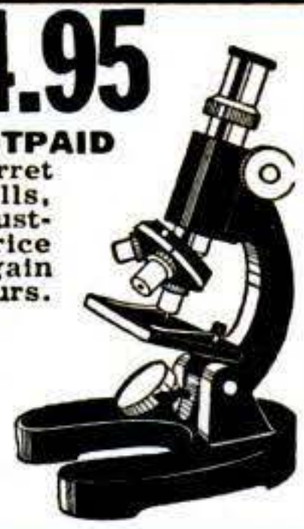

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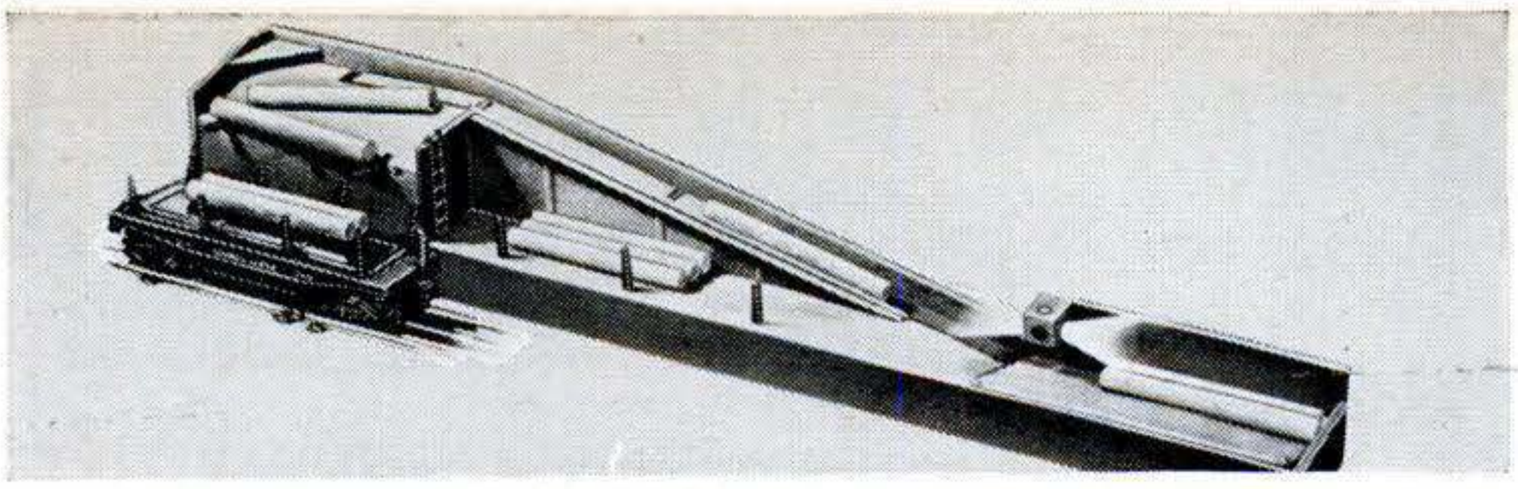
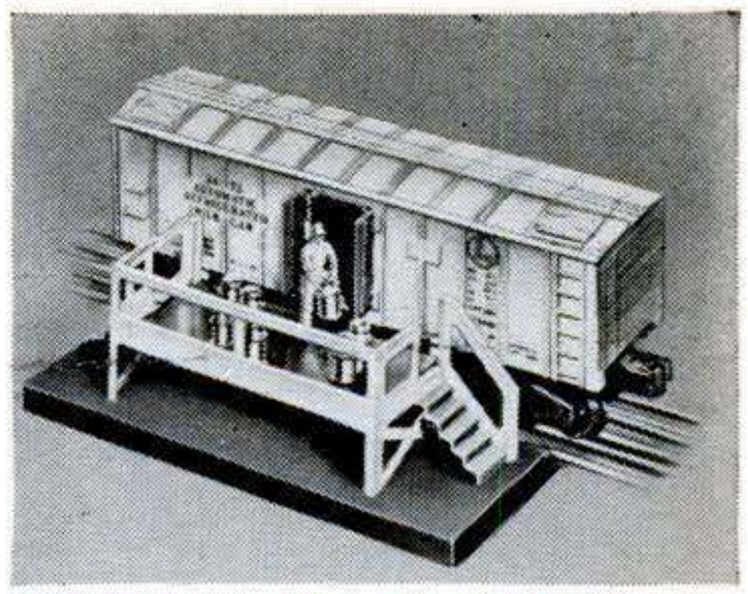


Conveyor Type Operating Lumber Loader — Push remote control button and conveyor belt starts moving, picking up logs one at a time and raising them slowly to upper platform, from which they tumble automatically over tilting stakes into waiting car. No siding needed!



Operating Milk Car and Platform — Press remote control button and doors open, milkman picks up dairy cans one at a time, puts them on platform. (Tiny magnets in bottoms of cans hold them upright!) Pure white car with real "reefer" detail. Stainless steel platform.

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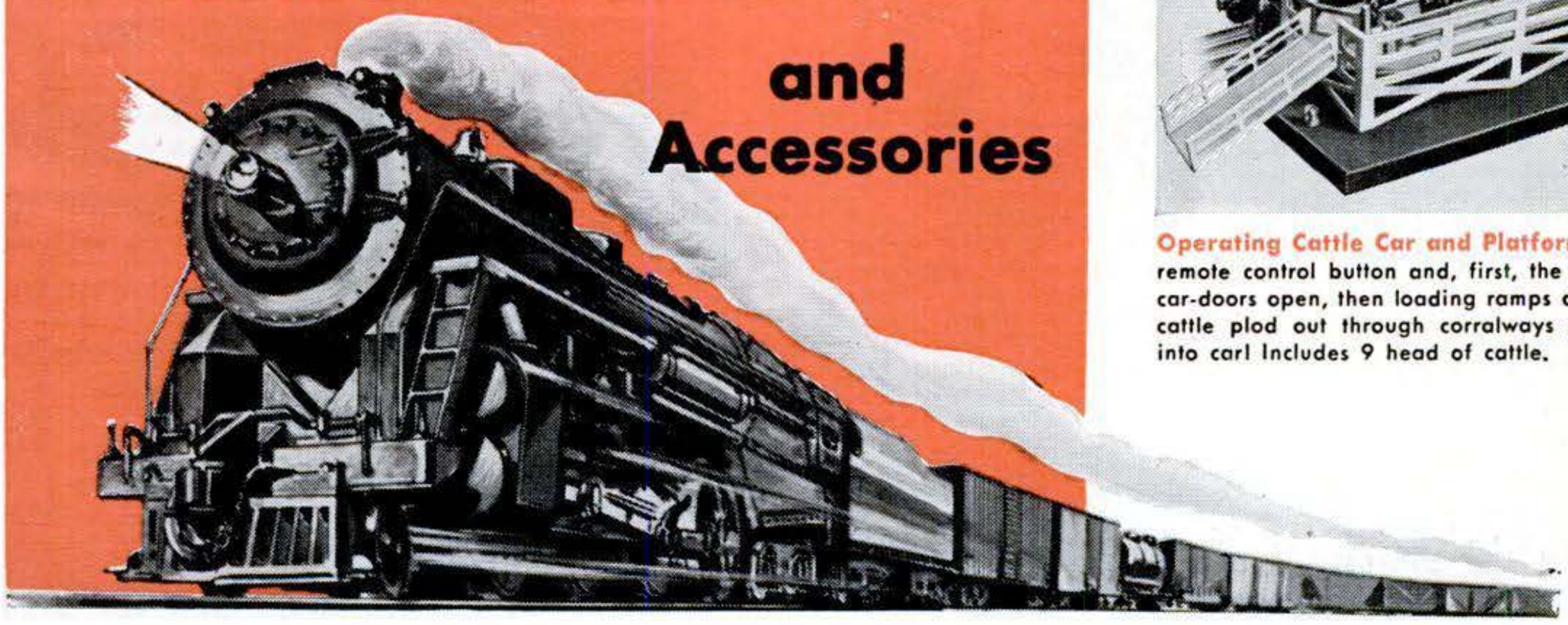
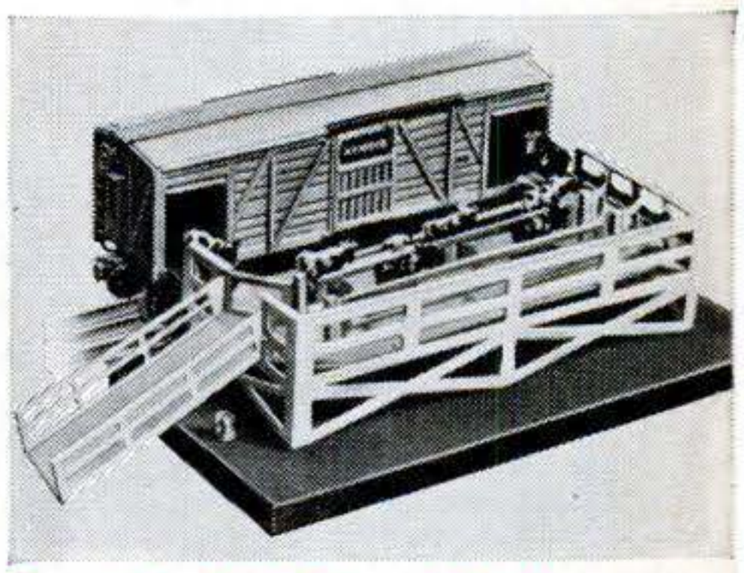
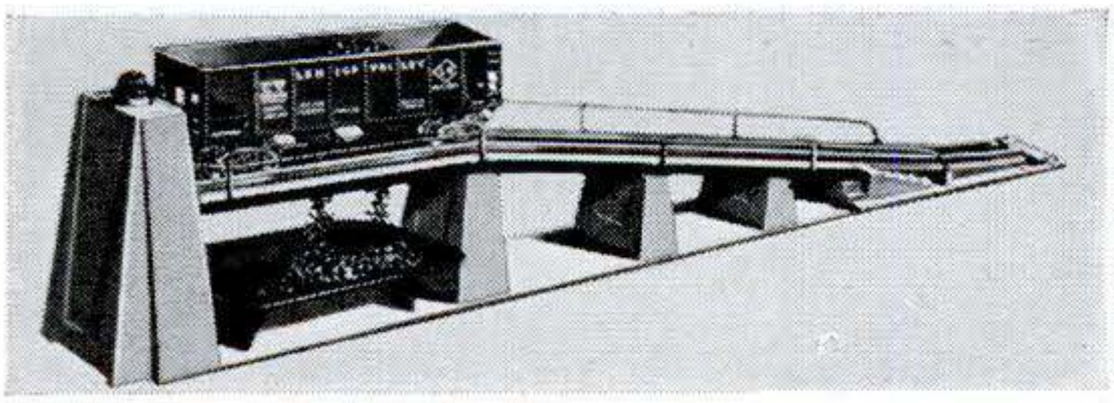
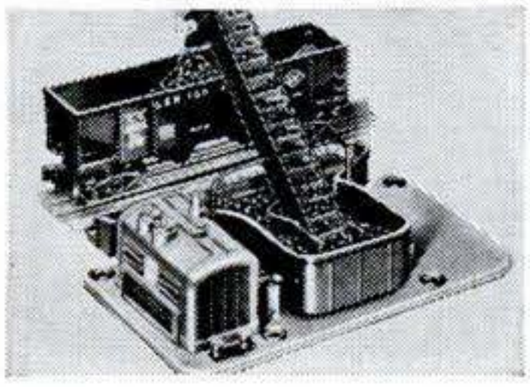




Operating Cattle Car and Platform — Press remote control button and, first, the overhead car-doors open, then loading ramps drop, then cattle plod out through corralways and back into car! Includes 9 head of cattle.



Operating Coal Ramp and Hopper Car — Three remote control operations after you switch hopper car onto ramp! Press first button and train uncouples from hopper car, to roll away. Press second button and hoppers open, coal unloads into bin. Press third button and hopper car uncouples, to roll back to lower track. Includes ramp, hopper, coal.



Diesel Type Operating Coal Loader — Remote control switch loads car with artificial coal carried up in conveyor buckets. Operates anywhere on track, no sidings needed.

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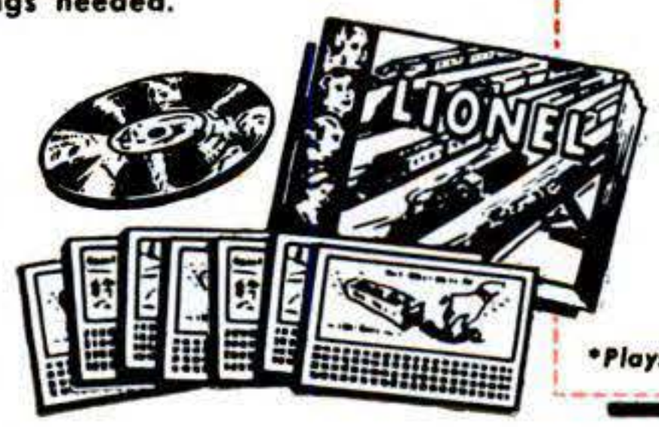

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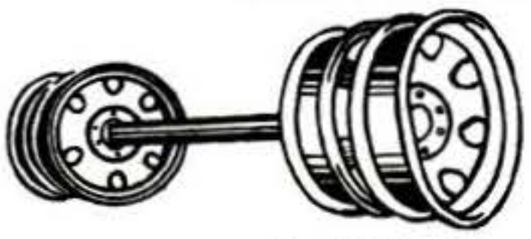

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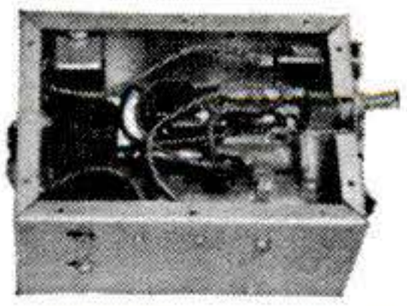

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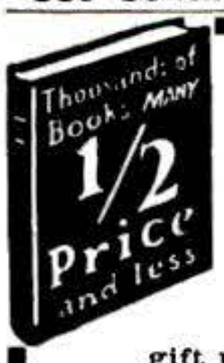

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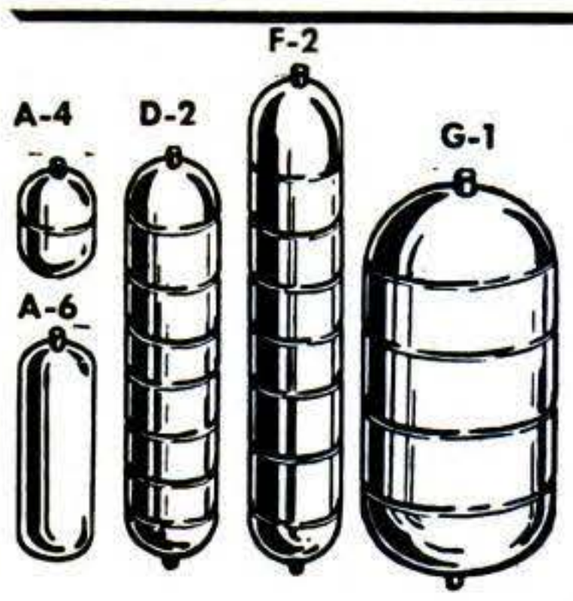

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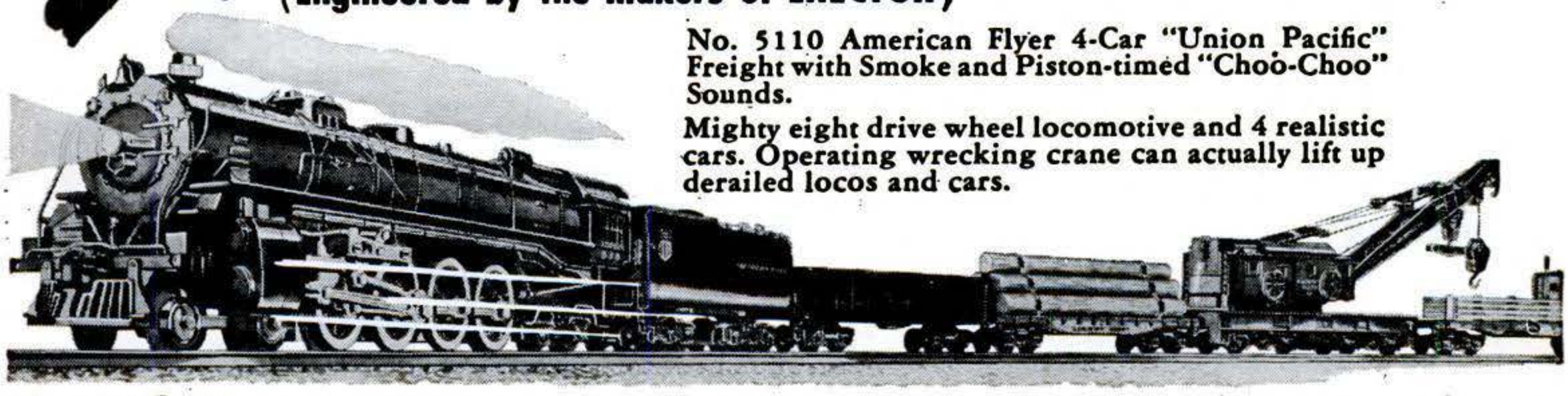

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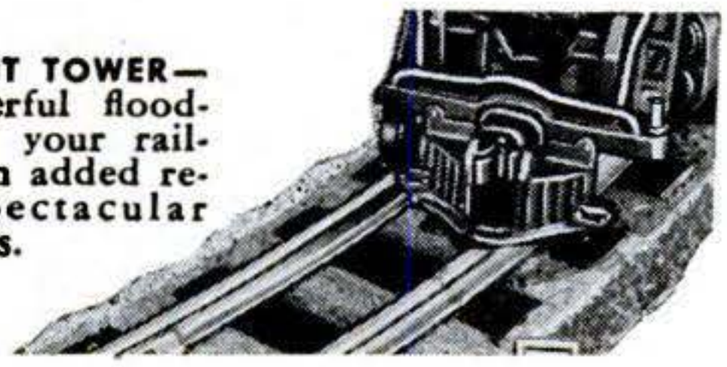

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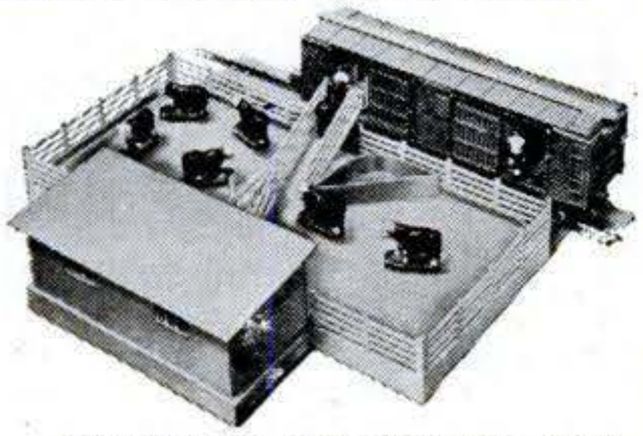

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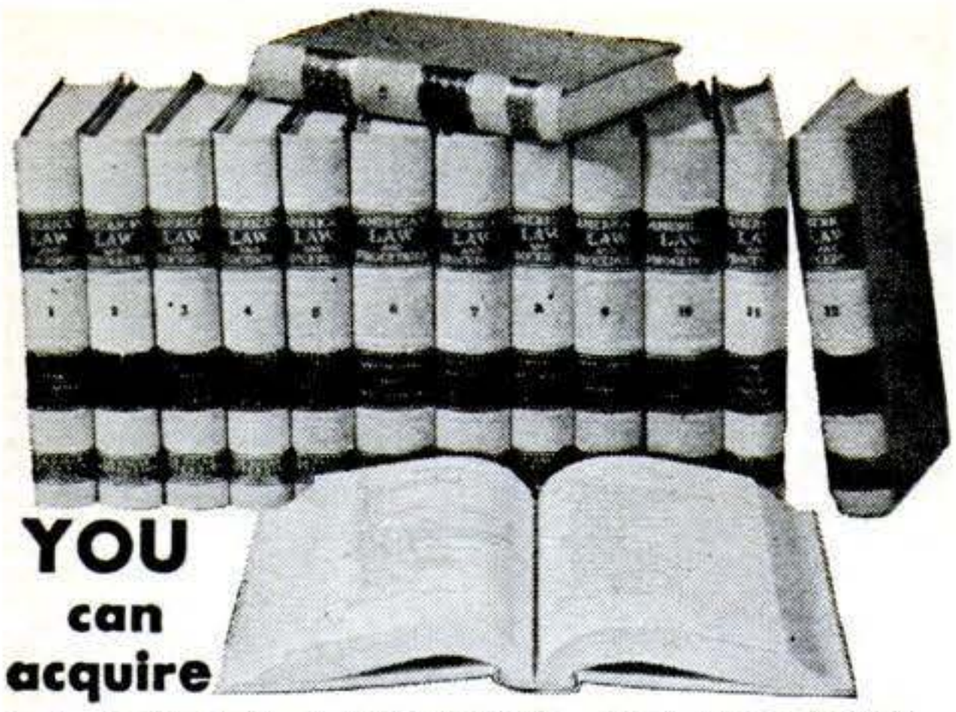

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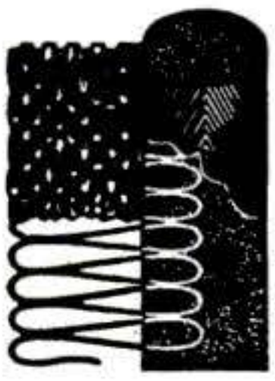

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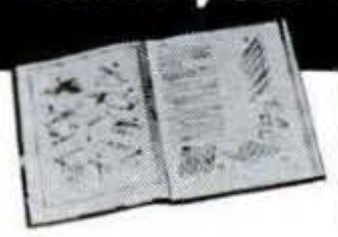

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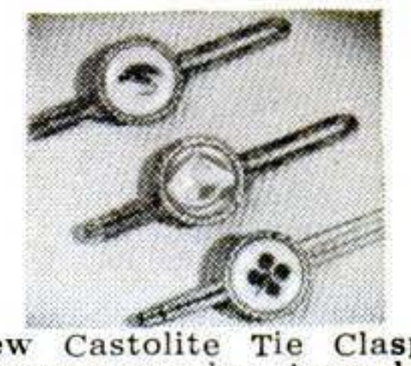

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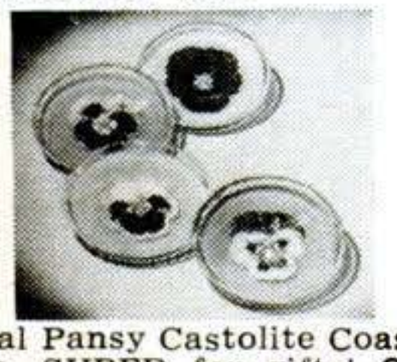

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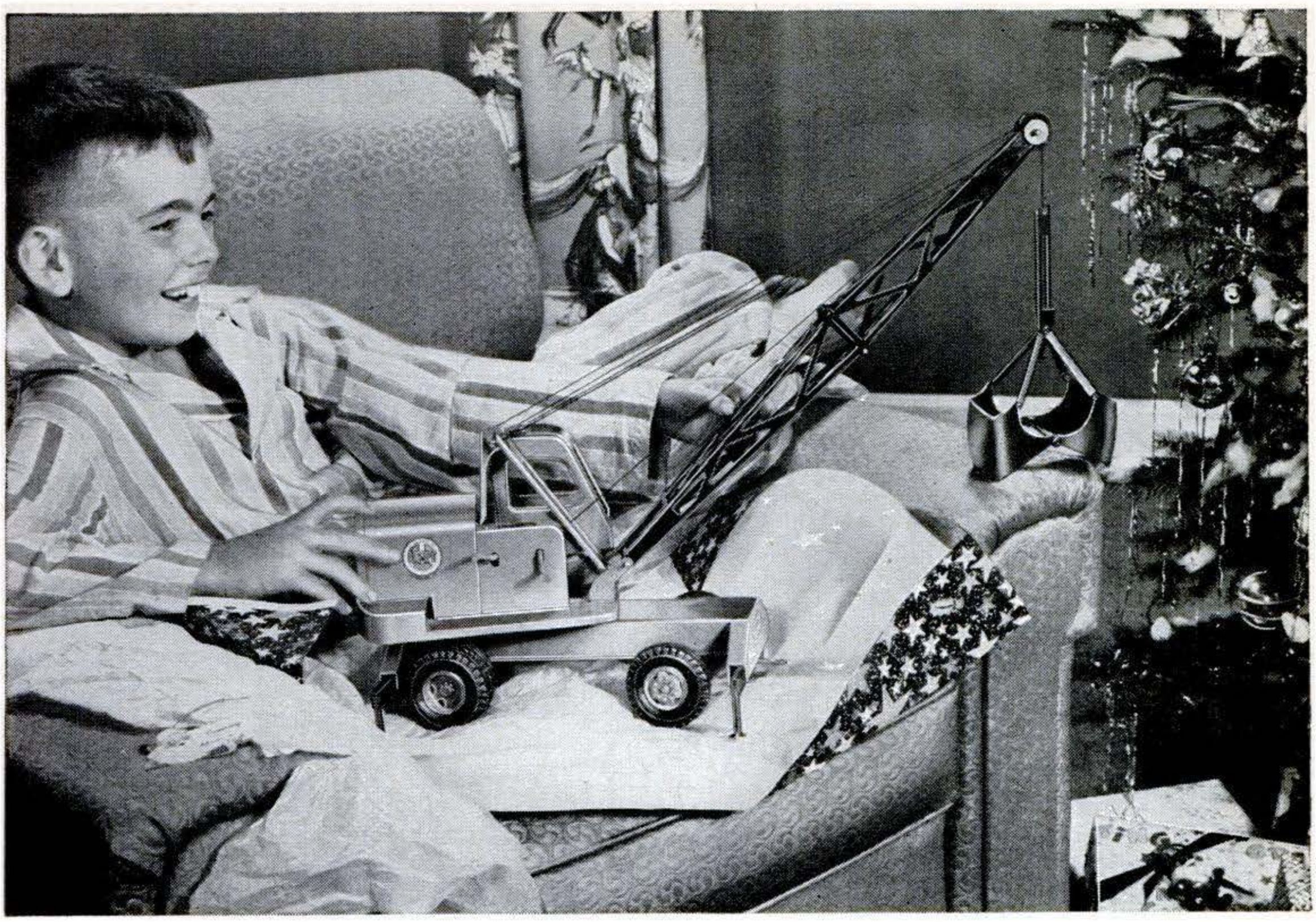

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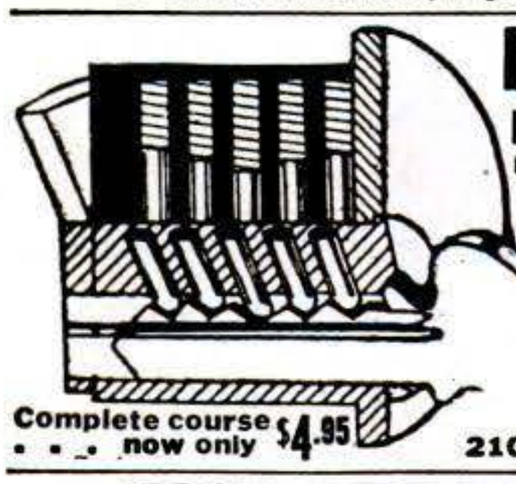

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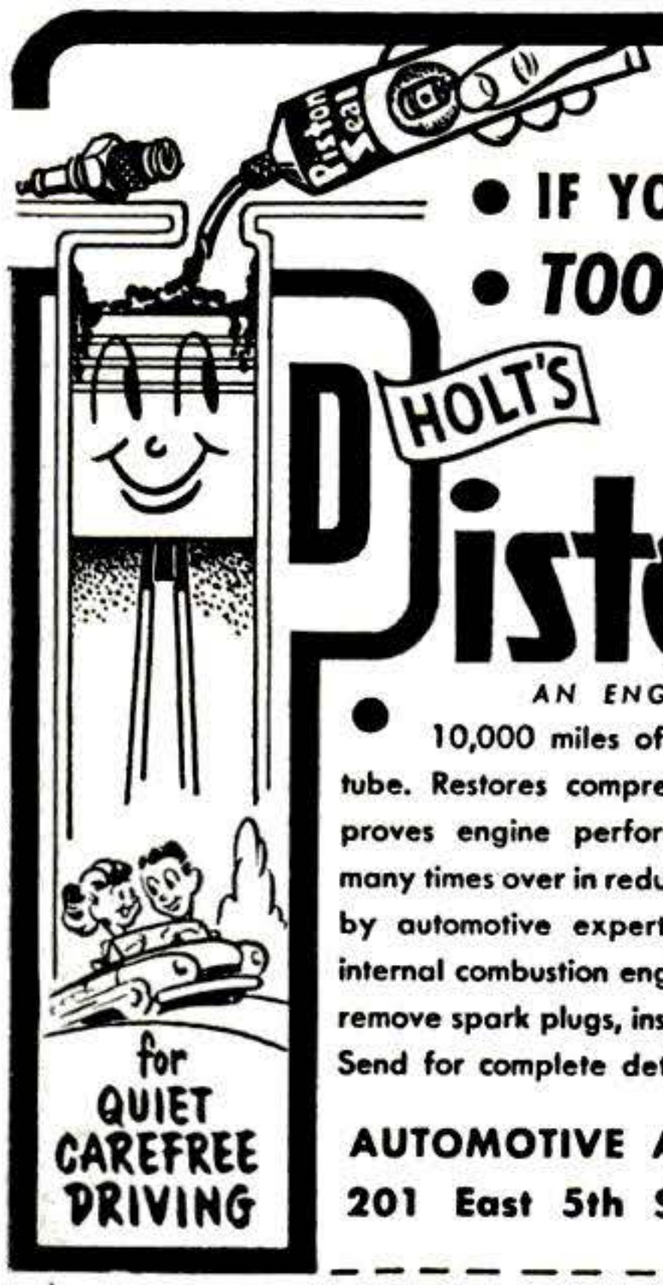

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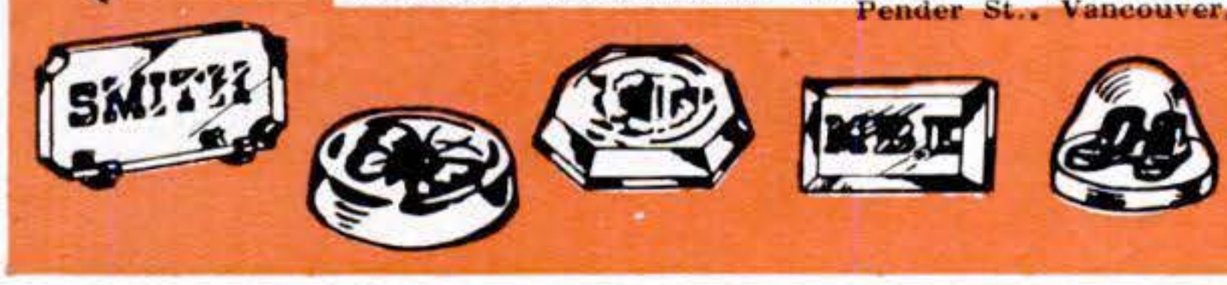

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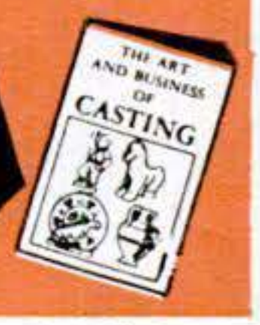

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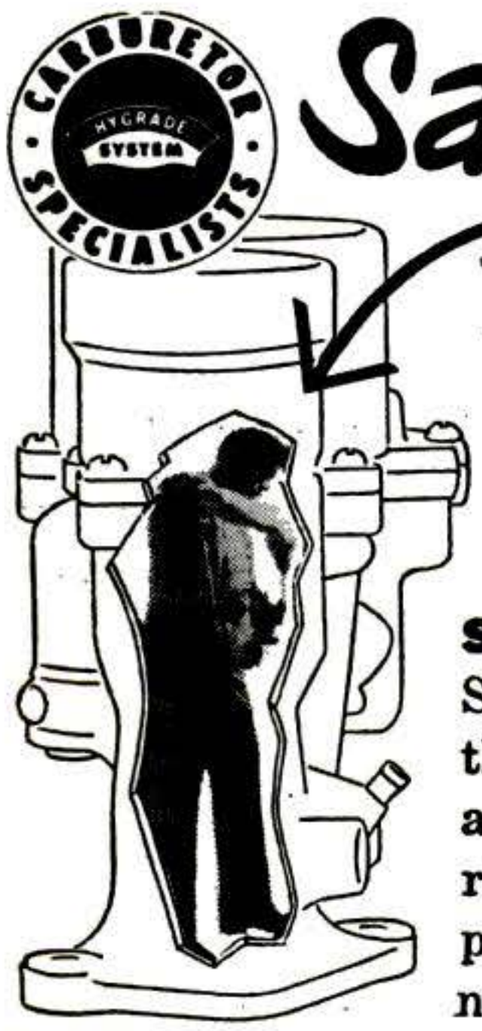

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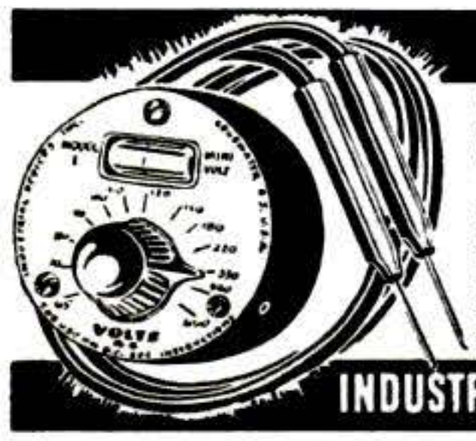

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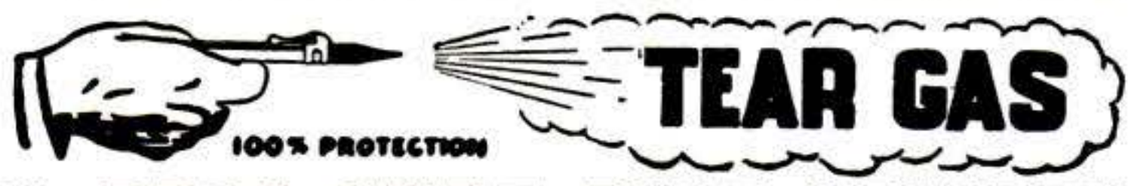

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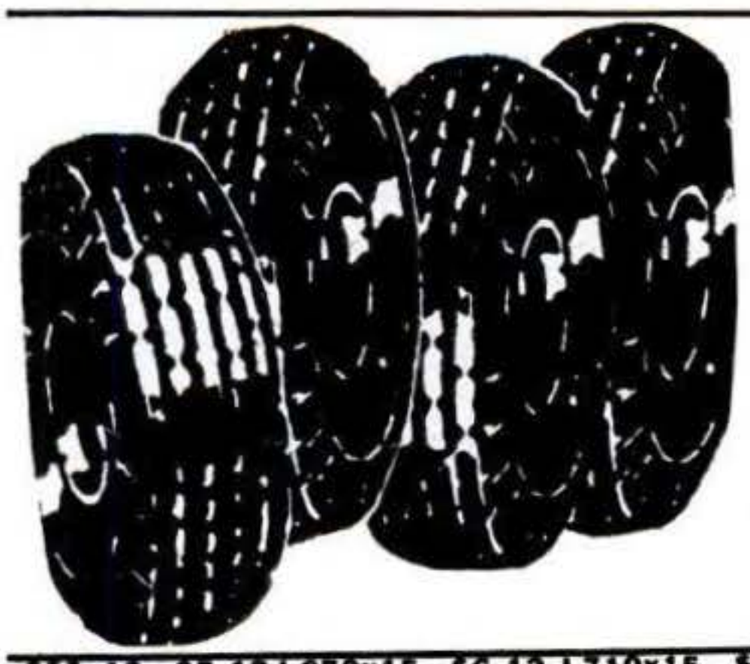

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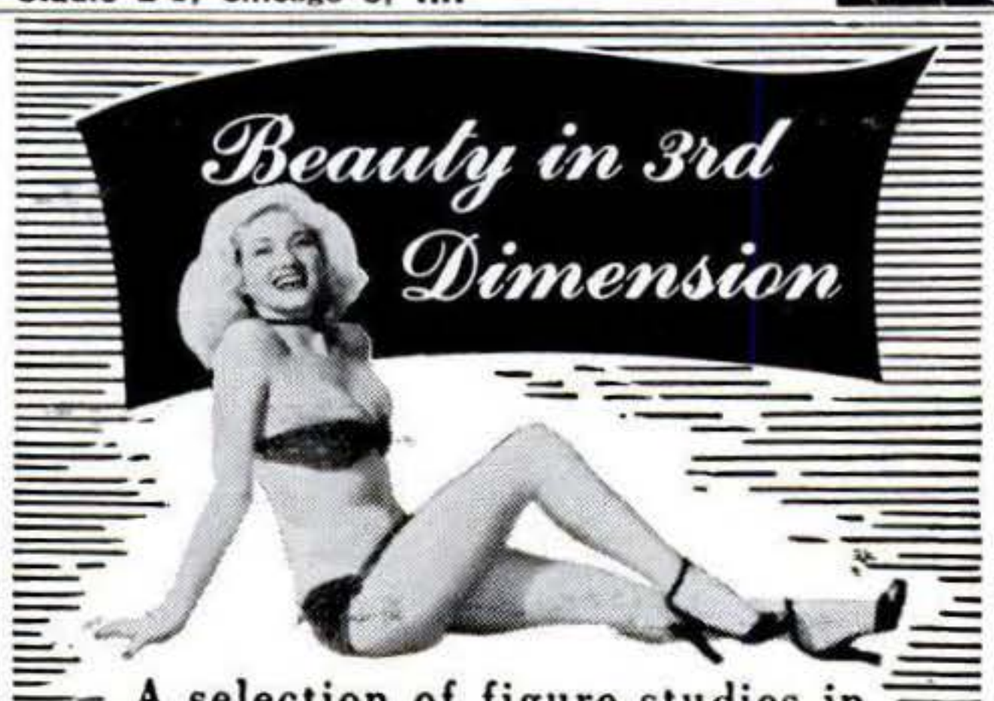

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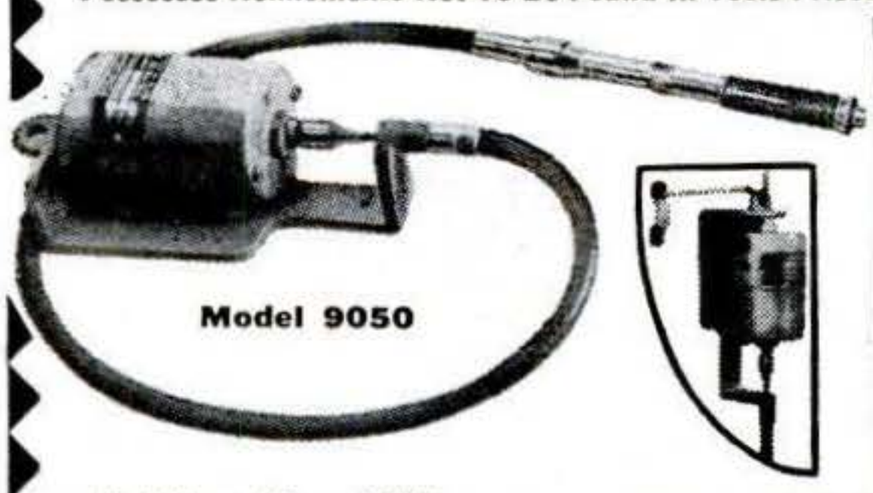

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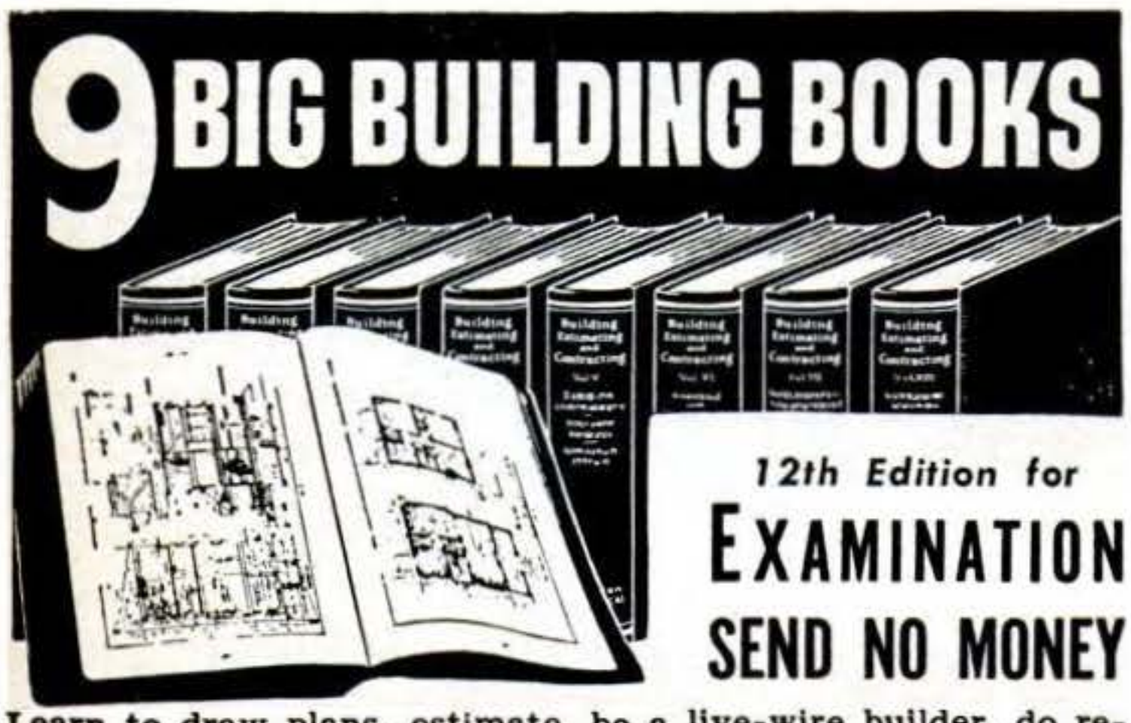

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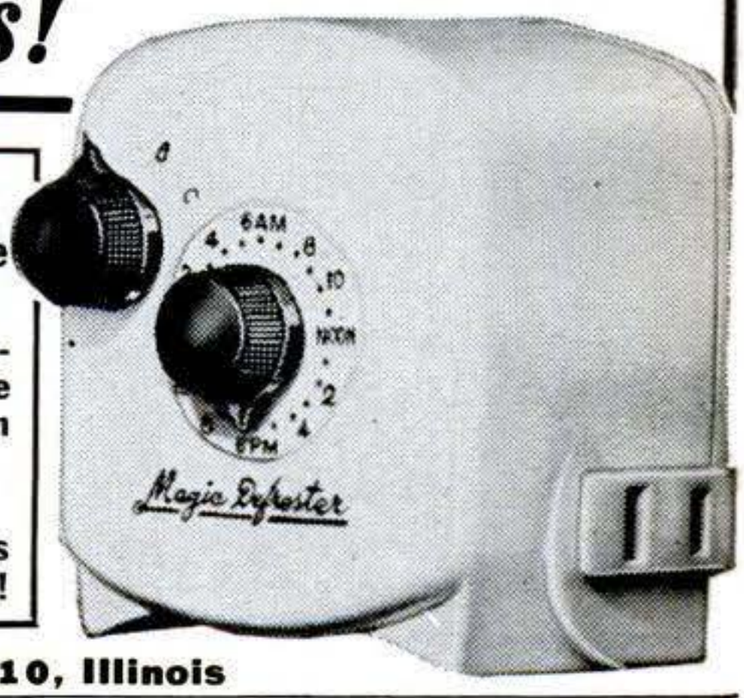

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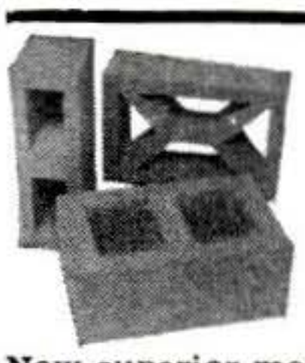

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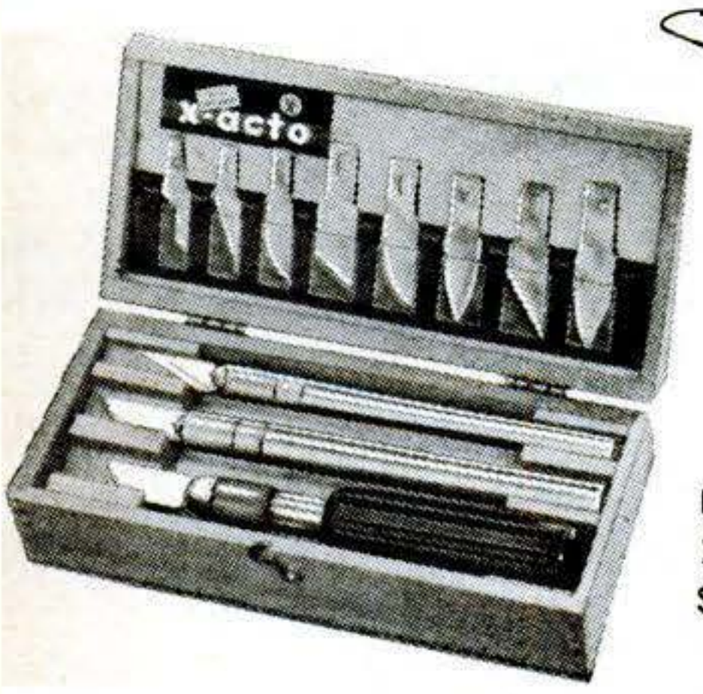

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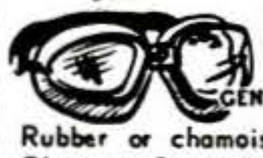

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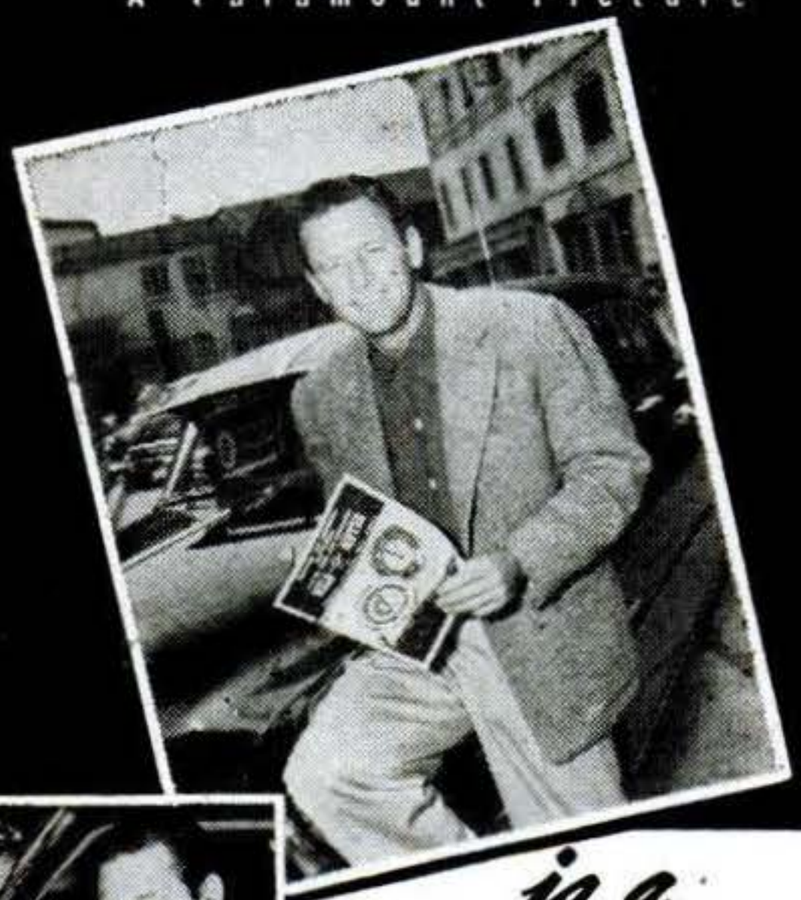

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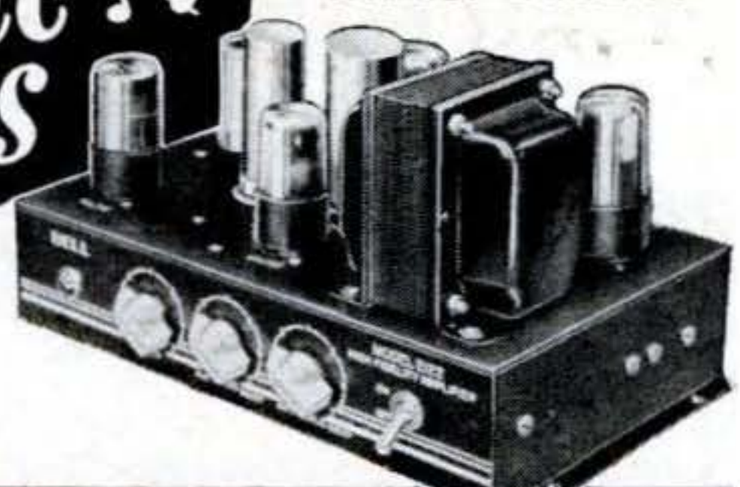

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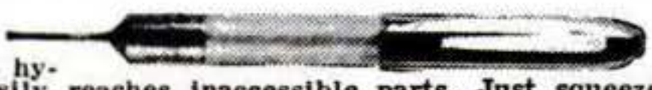

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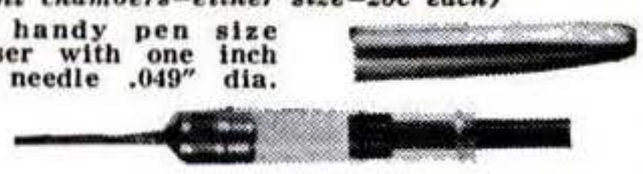

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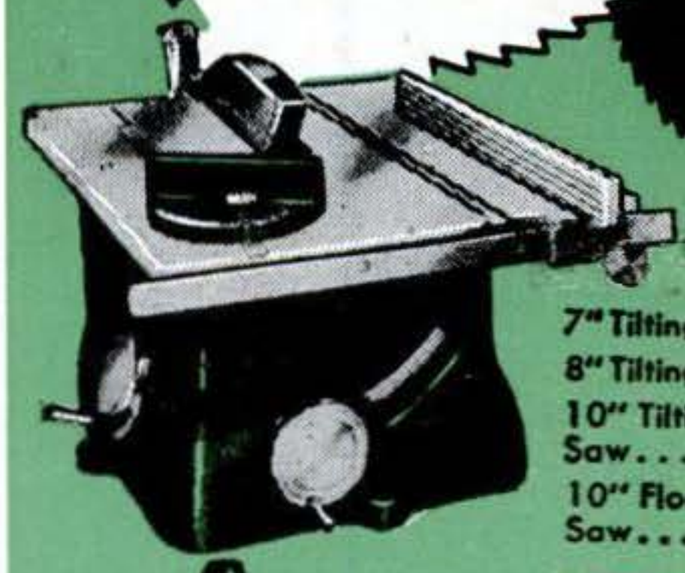

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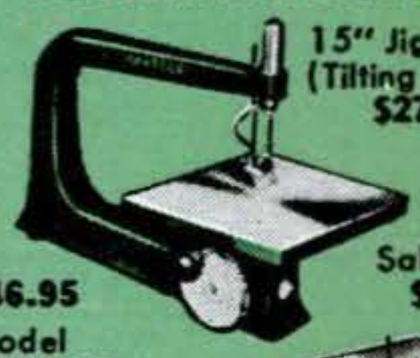

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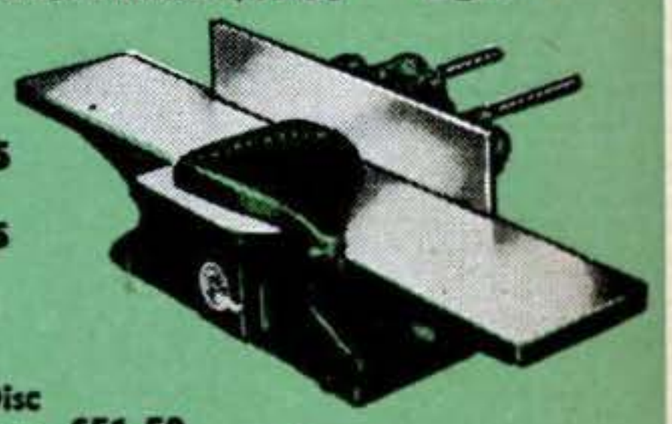

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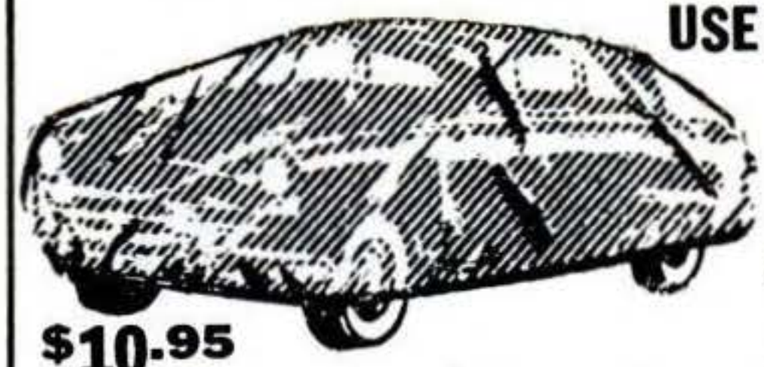

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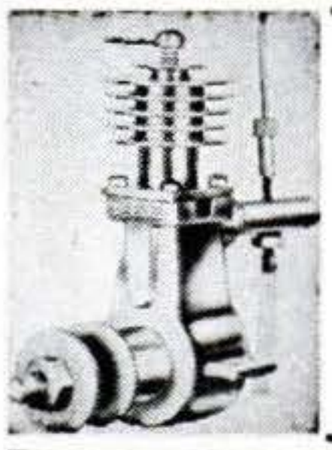

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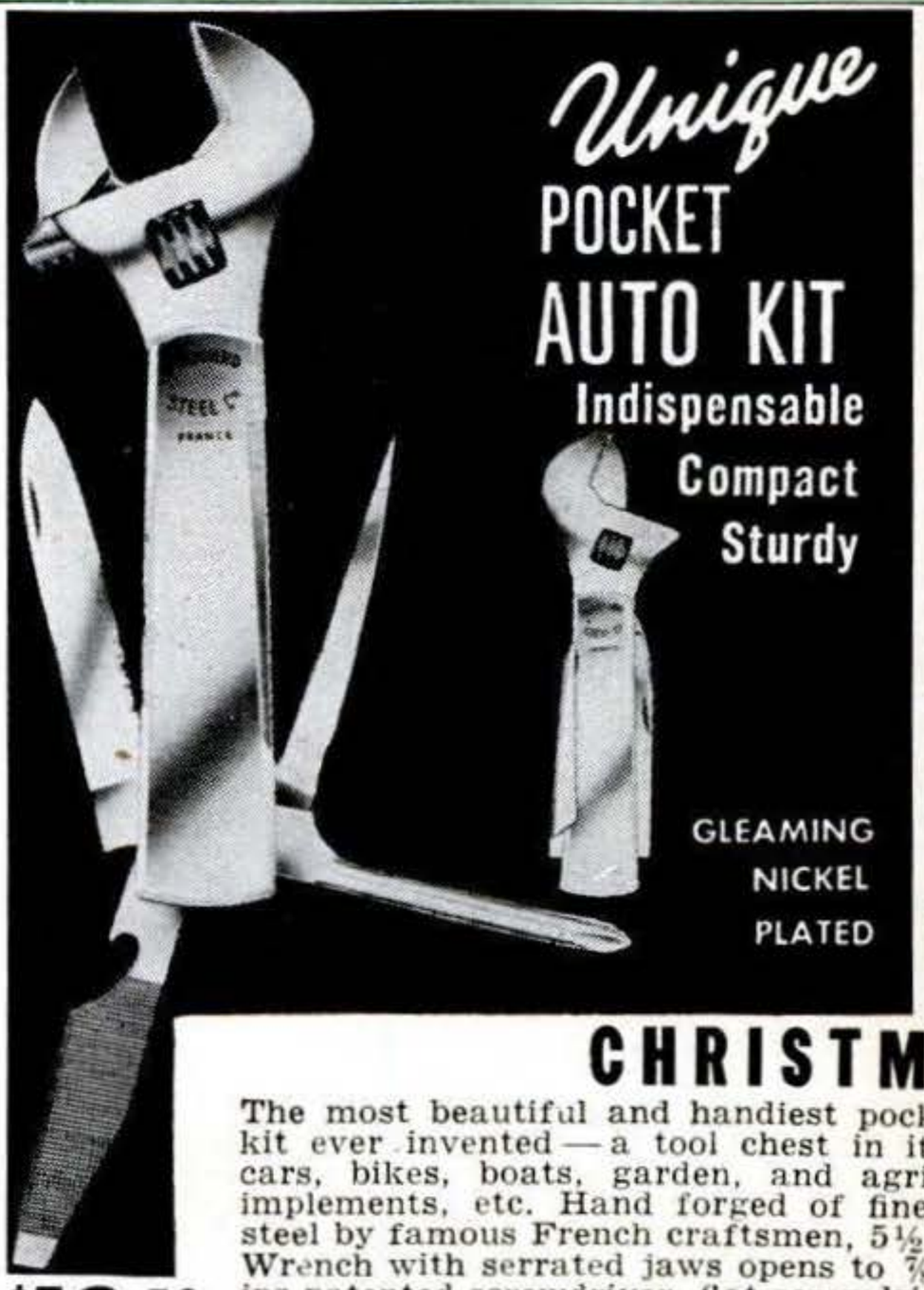

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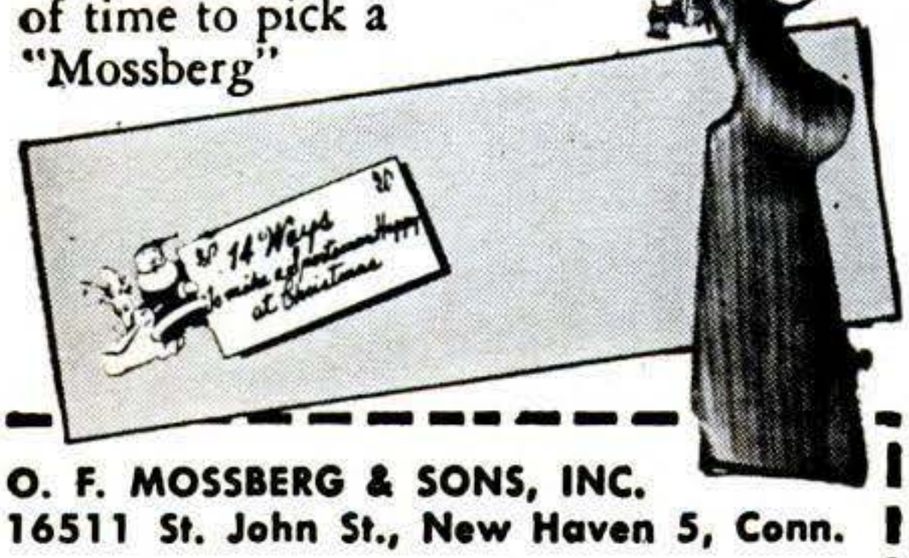

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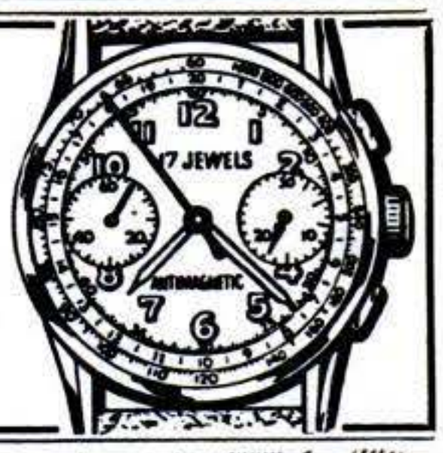

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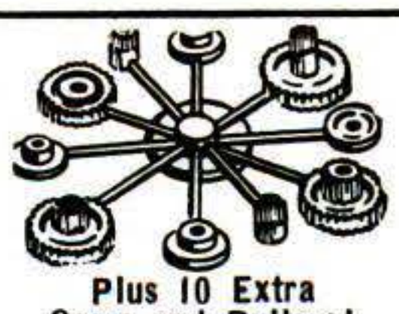

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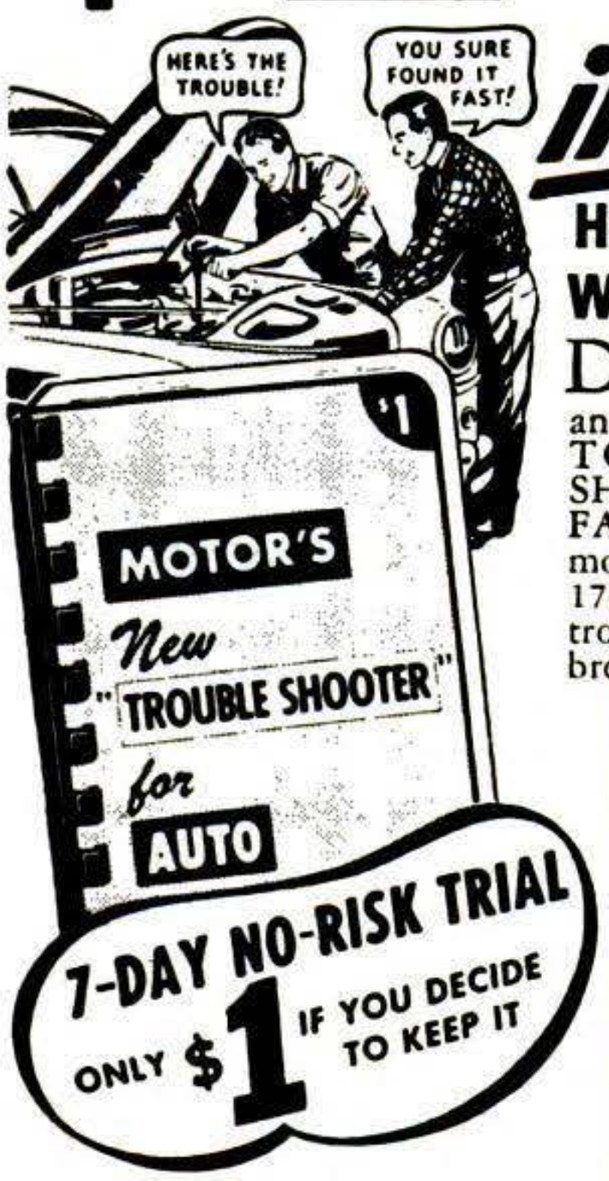

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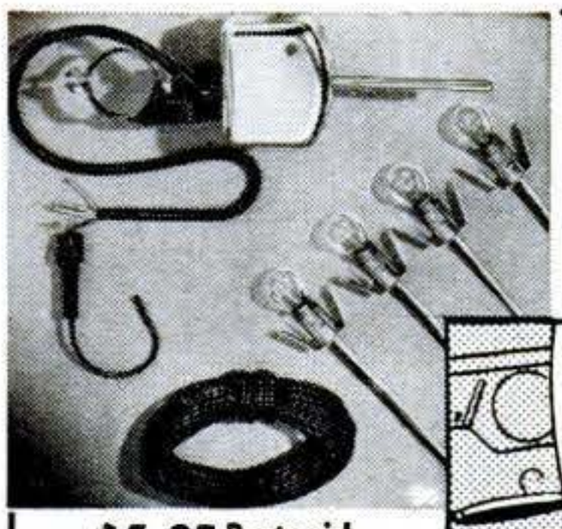

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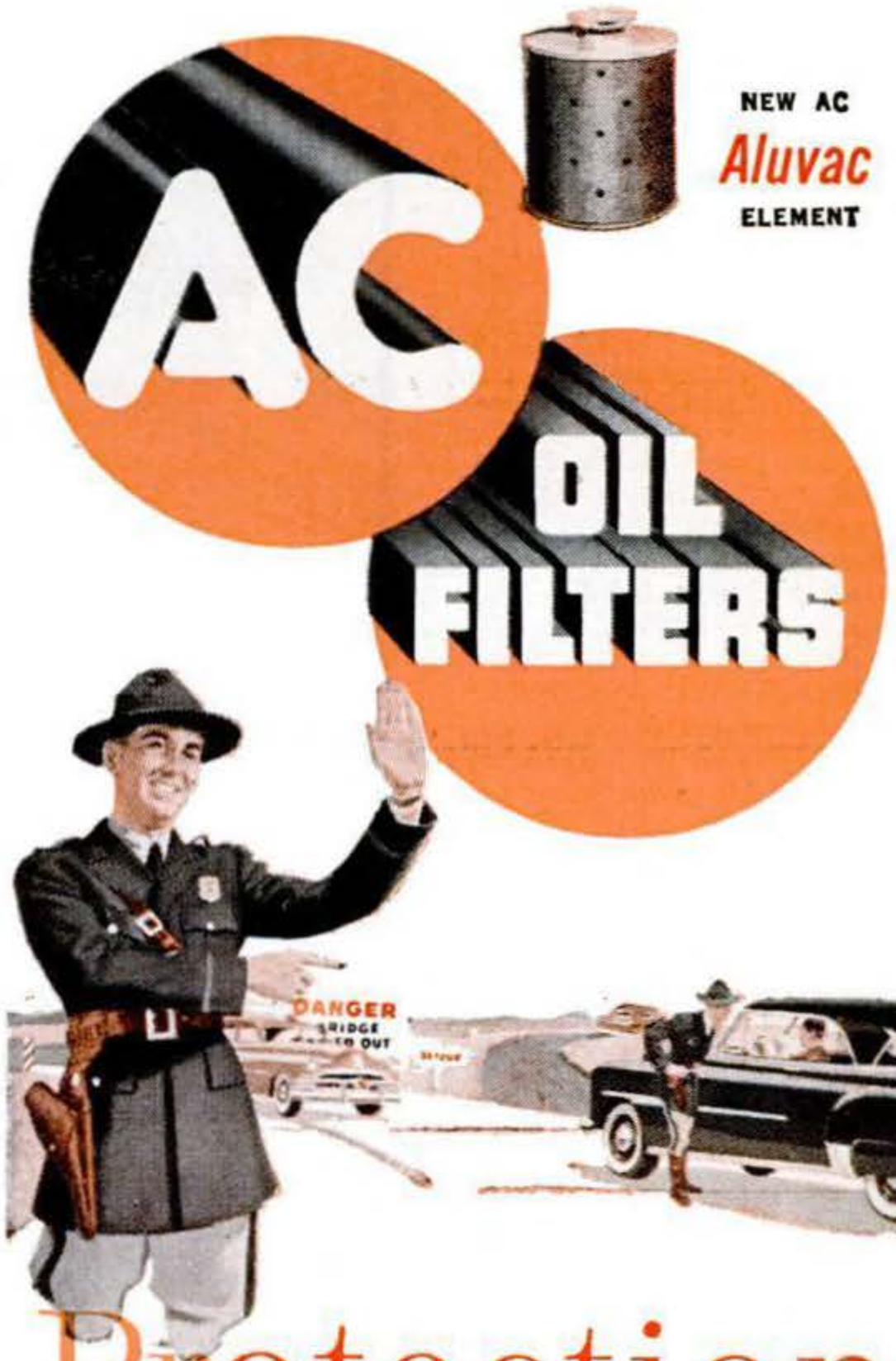

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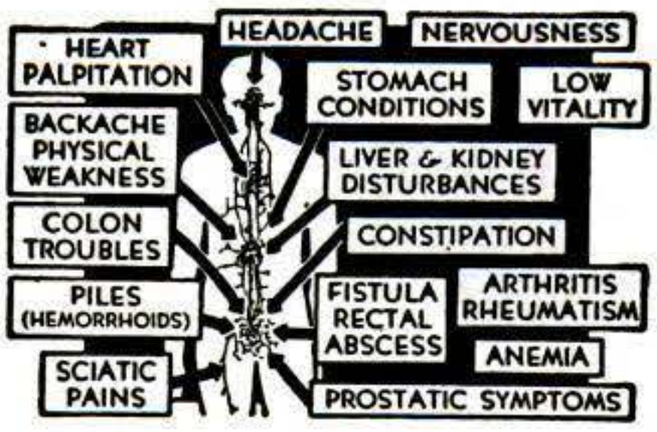

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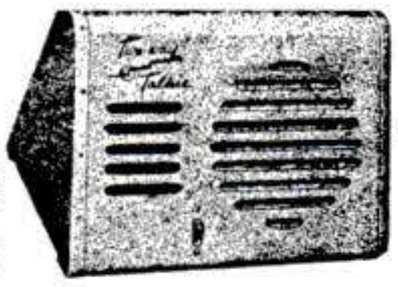

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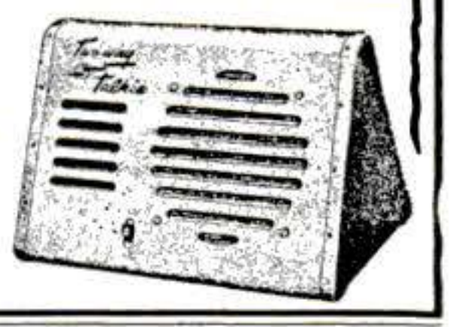

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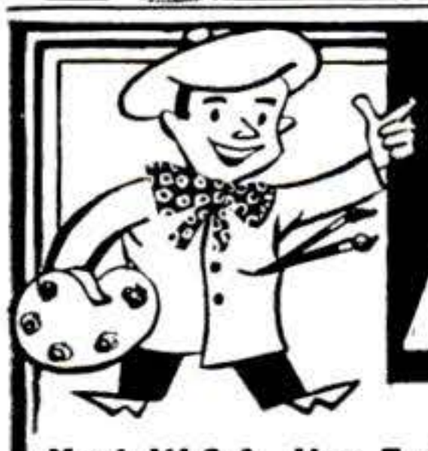

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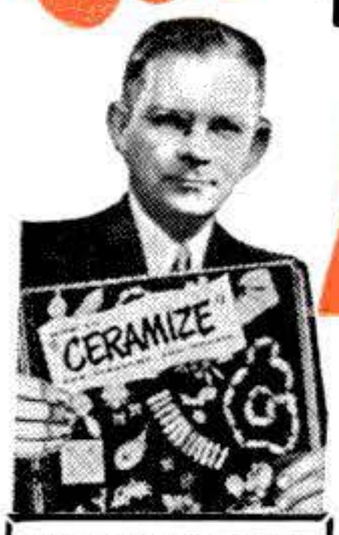

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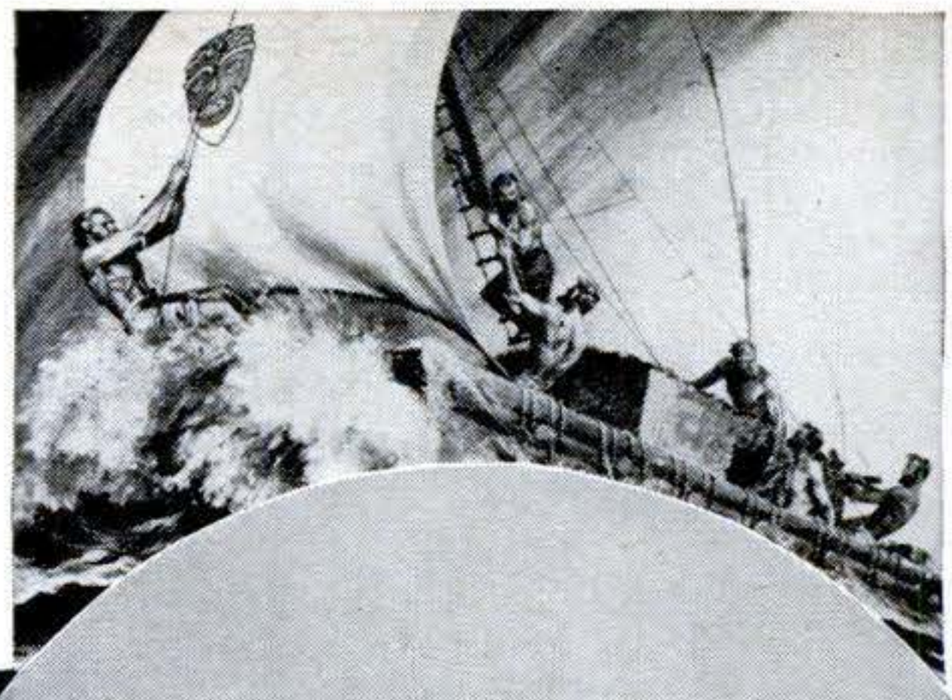

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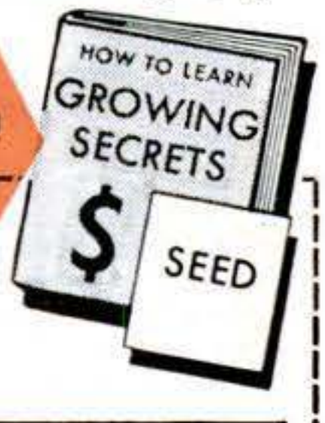

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38 MONEYMAKING OPPORTUNITIES

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DETECTIVES Earn Big Money. Experience unnecessary. Detective Particulars free. Wagoner. P-125 West 86th. N. Y. 24.

SCHOOL Seniors—Earn sensational profits selling classmates America's Most Beautiful Graduation Name Cards. Largest selection. Outsells all others. Free sample kit. Printcraft. Dept. P. 1425 E. Elm Street. Scranton 5. Penna.

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PRINT Without A Printing Press. Big Money! See page 74.

MAKE Money addressing Envelopes at Home! Our information reveals how. Only 30c. Business Bureau. Dept. 45-M. P.O. Box 2224. St. Louis. Mo.

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CHEMICALS and apparatus for industrial. analytical. and private laboratories. Catalog 15c. Dept. M-26. Biological Supply Co.. 1176 Mt. Hope Ave.. Rochester 20. N.Y.

42 HELP WANTED

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MAILING Lists. All kinds 1000 $5.00. Dixie Service. King. N. Carolina.

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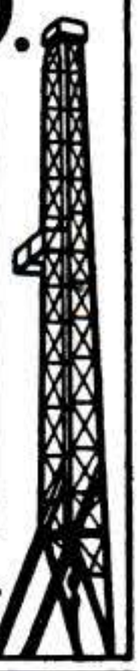

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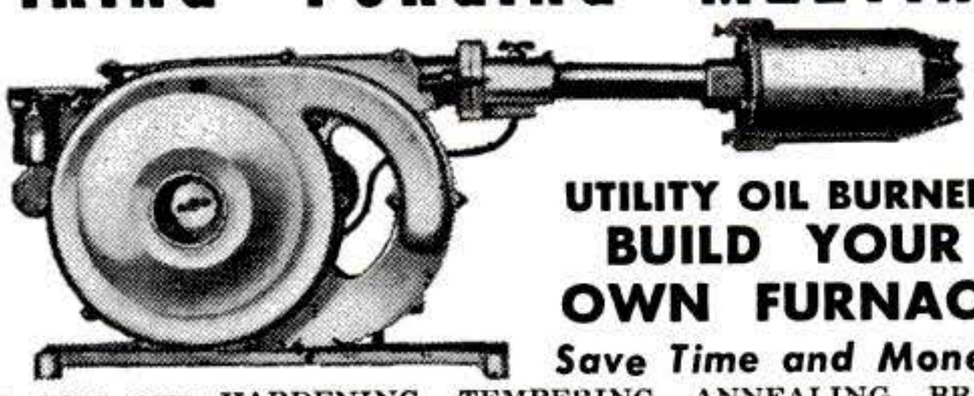

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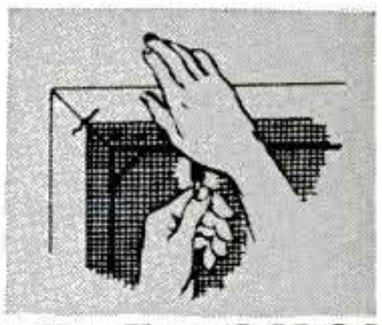

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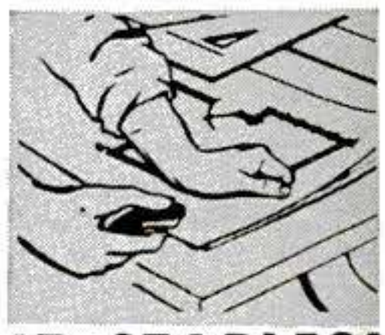

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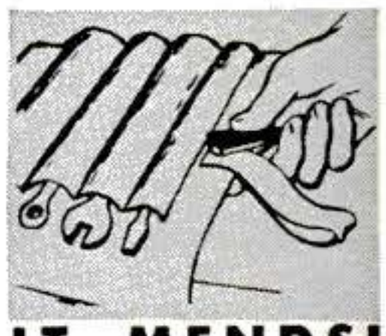

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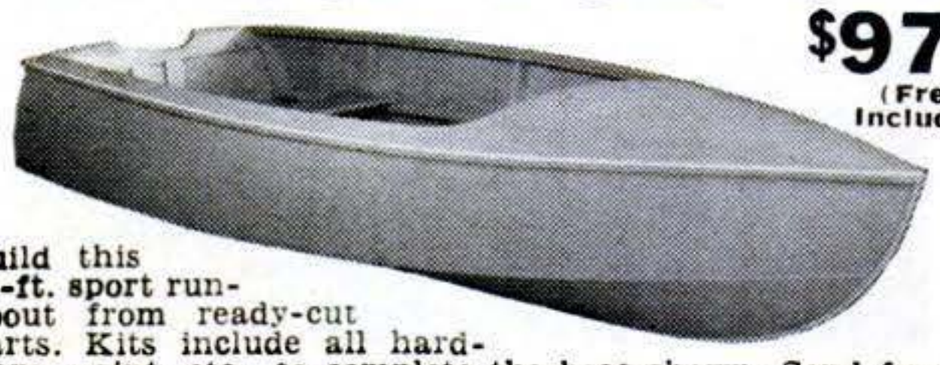

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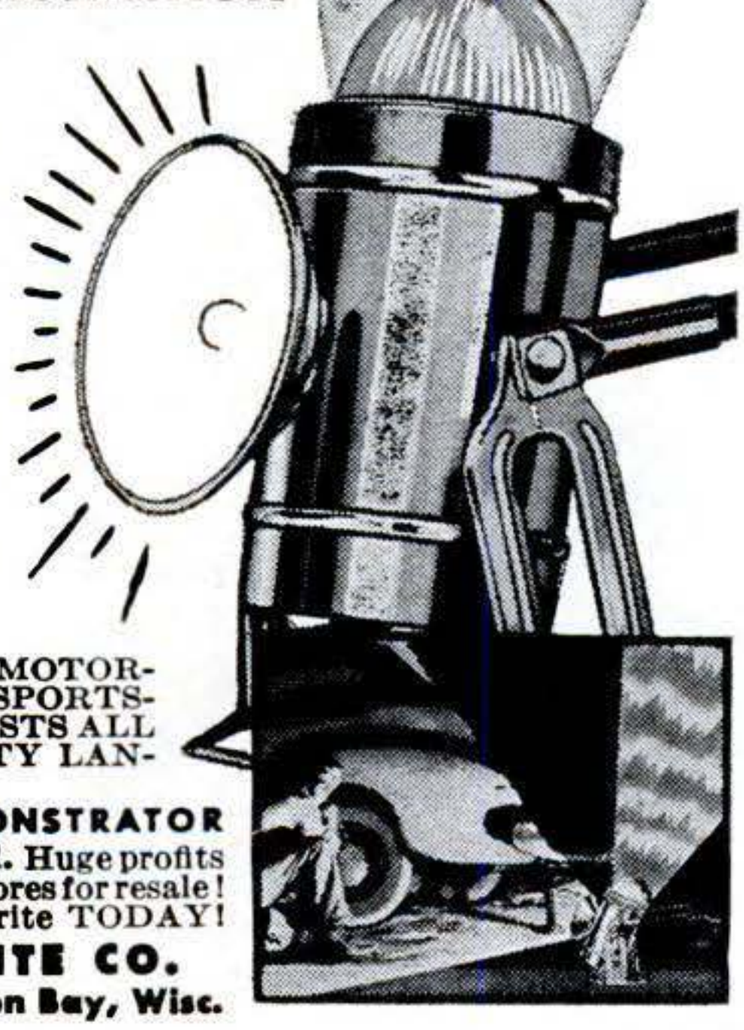

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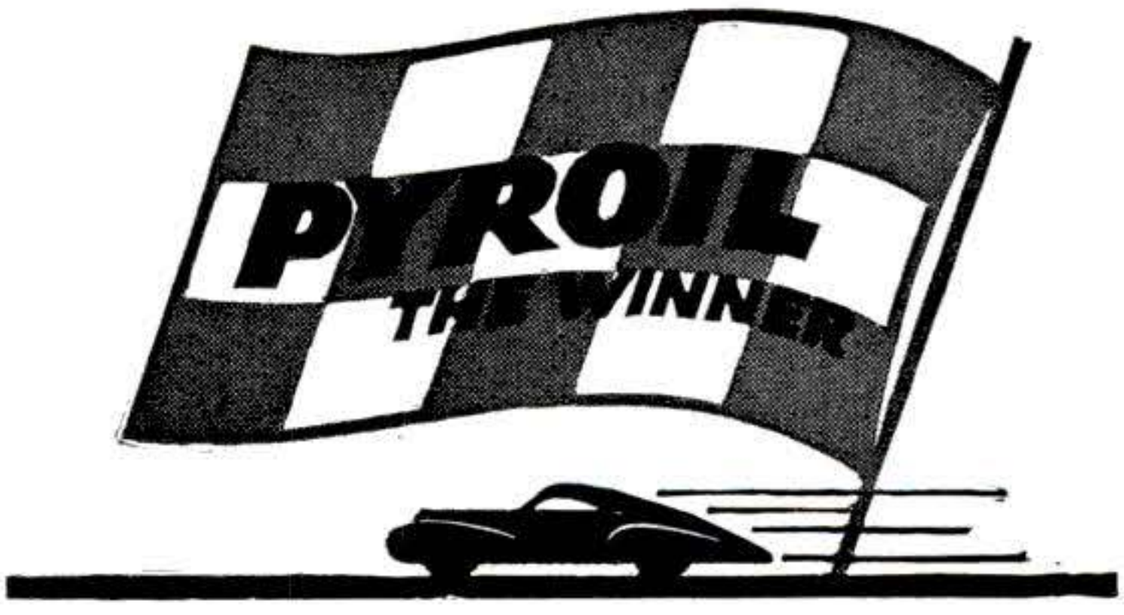

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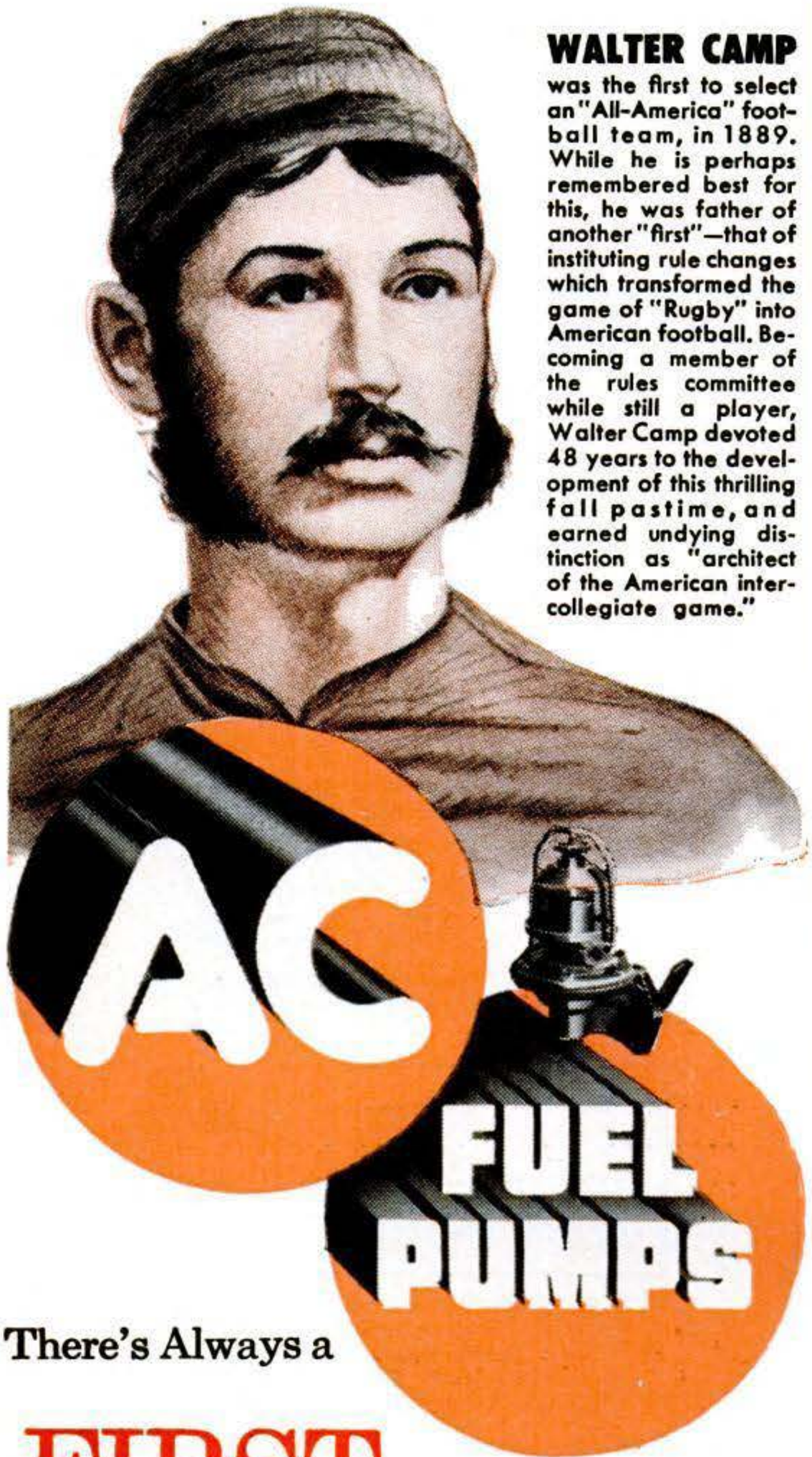

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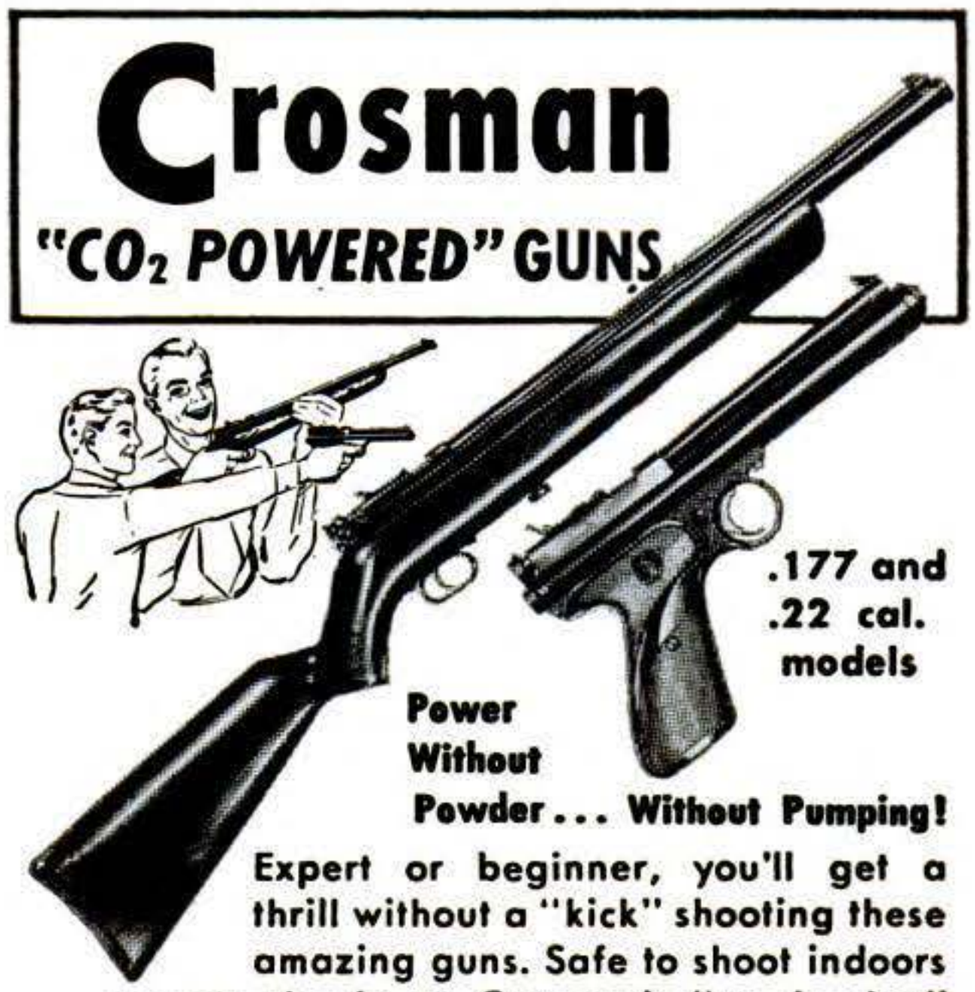

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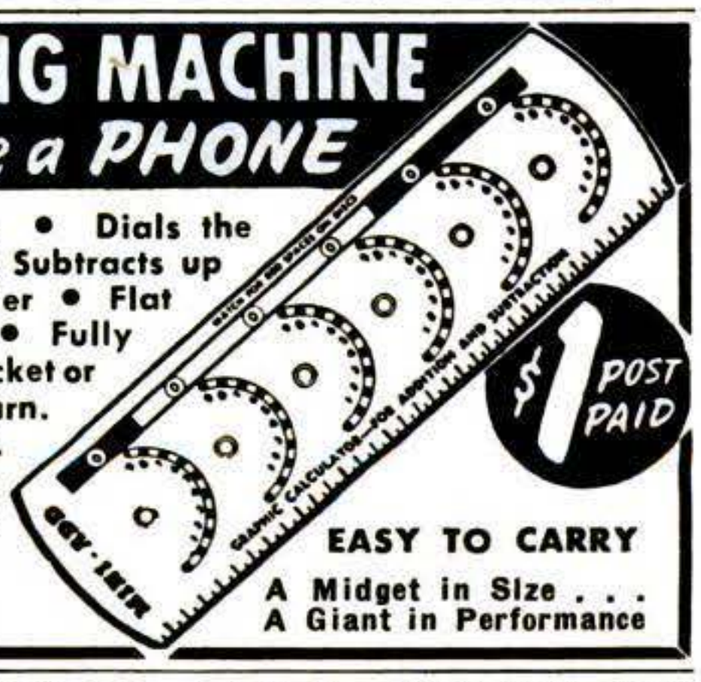

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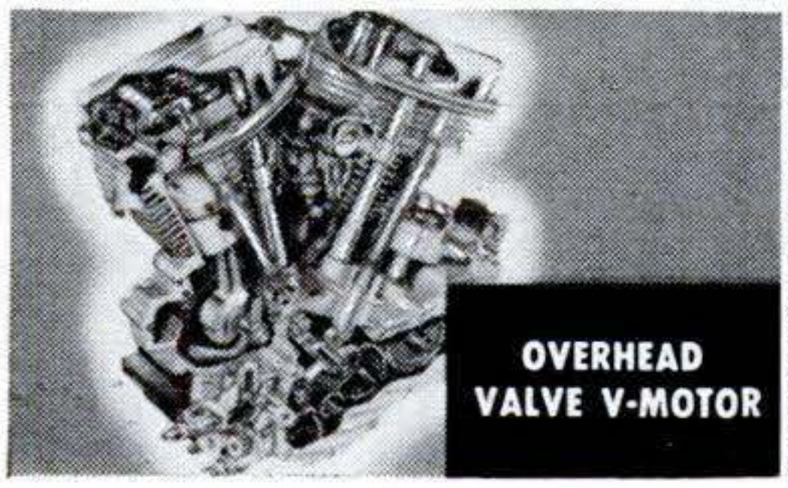

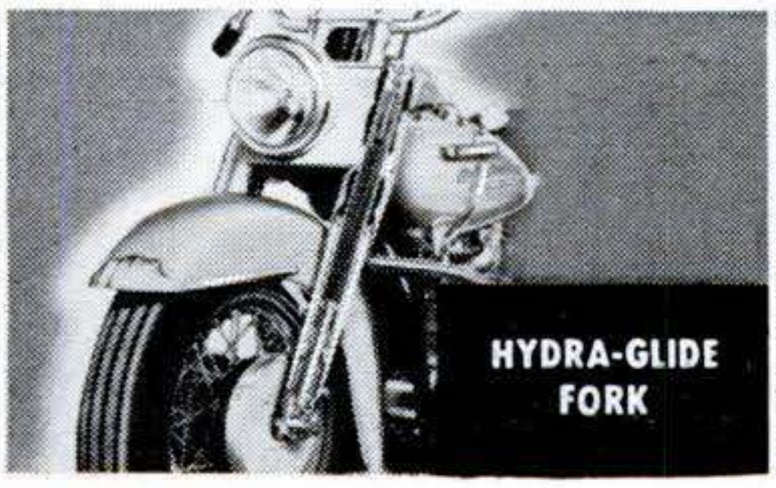

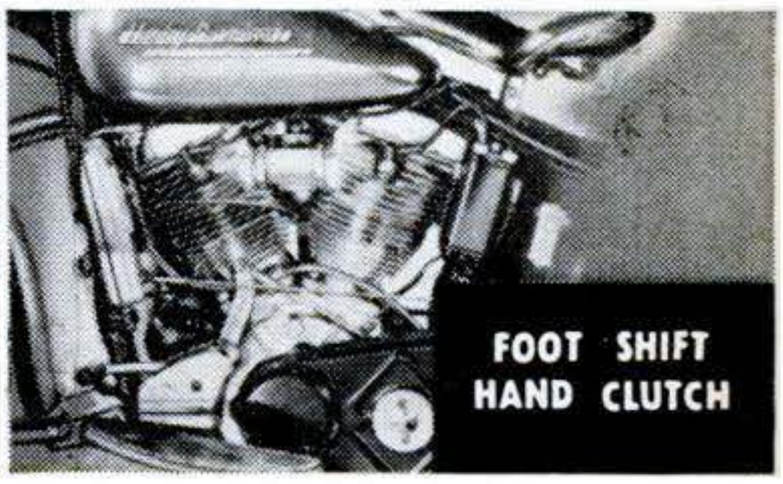

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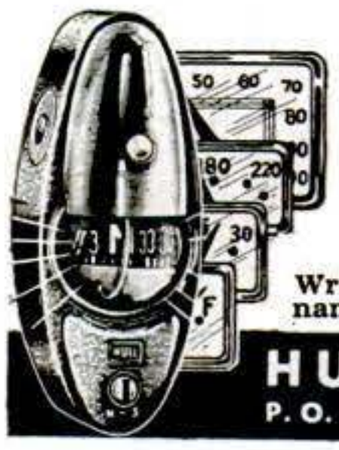

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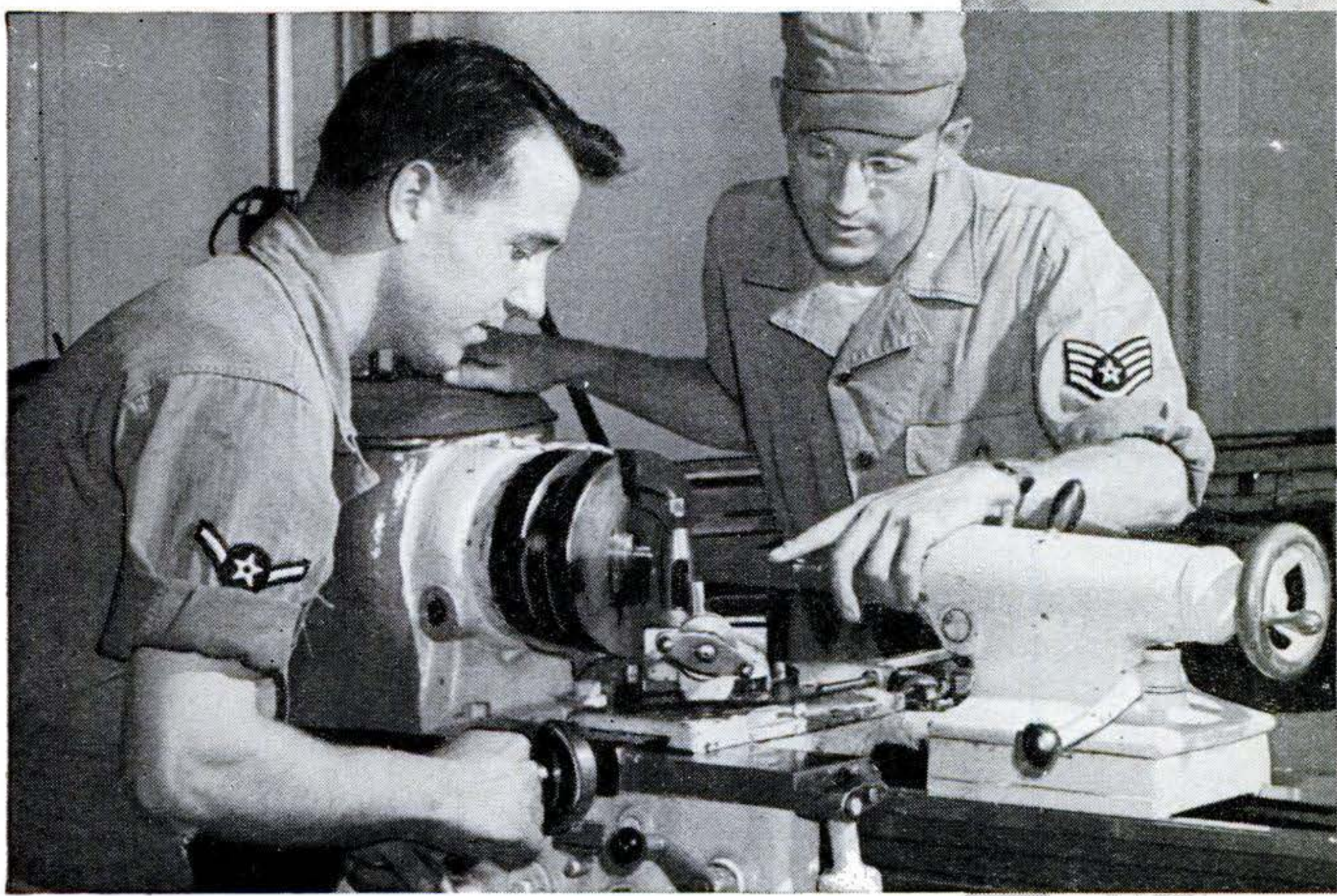

Accent on Opportunity

Until recently Private First Class Myron Jarman of Beverly Hills, California, was a student at Santa Monica City College and U.C.L.A. One day he read of the 45 career fields in the U. S. Air Force training program, and recognized his chance to combine his interests and aptitudes in creating a responsible job for himself.

Soon after enlisting he became a student machinist. In the photo, he is "blanking out a lathe model." Under his instructor, Staff Sergeant Albert D. Clark of Loveland, Colorado, Airman Jarman will learn mechanical drawing, blue print reading, use of small hand tools, lathes, milling machines, contour machines, shapers, heat treating and grinding.

After 21 weeks of school, Myron will be an apprentice machinist. As he advances in experience and ability, his rank and pay will increase. He can find a vital and interesting career in the U. S. Air Force.

You, too, can have this opportunity! You can earn while you learn, in the field where you qualify. Find *your* place in one of the more than six hundred job specialties in the Airman Career Program. For details visit your nearest U. S. Army and U. S. Air Force Recruiting Station.

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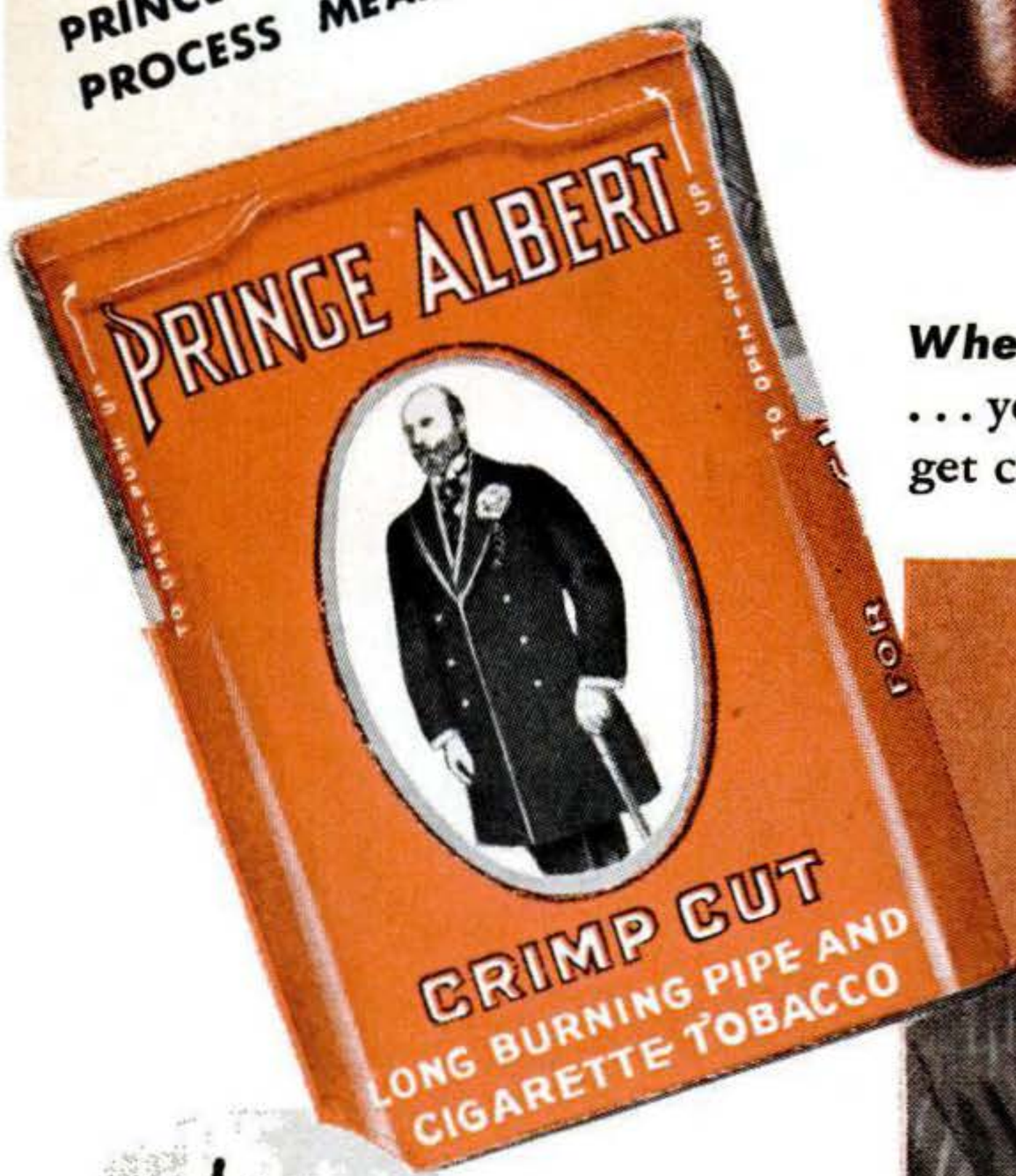

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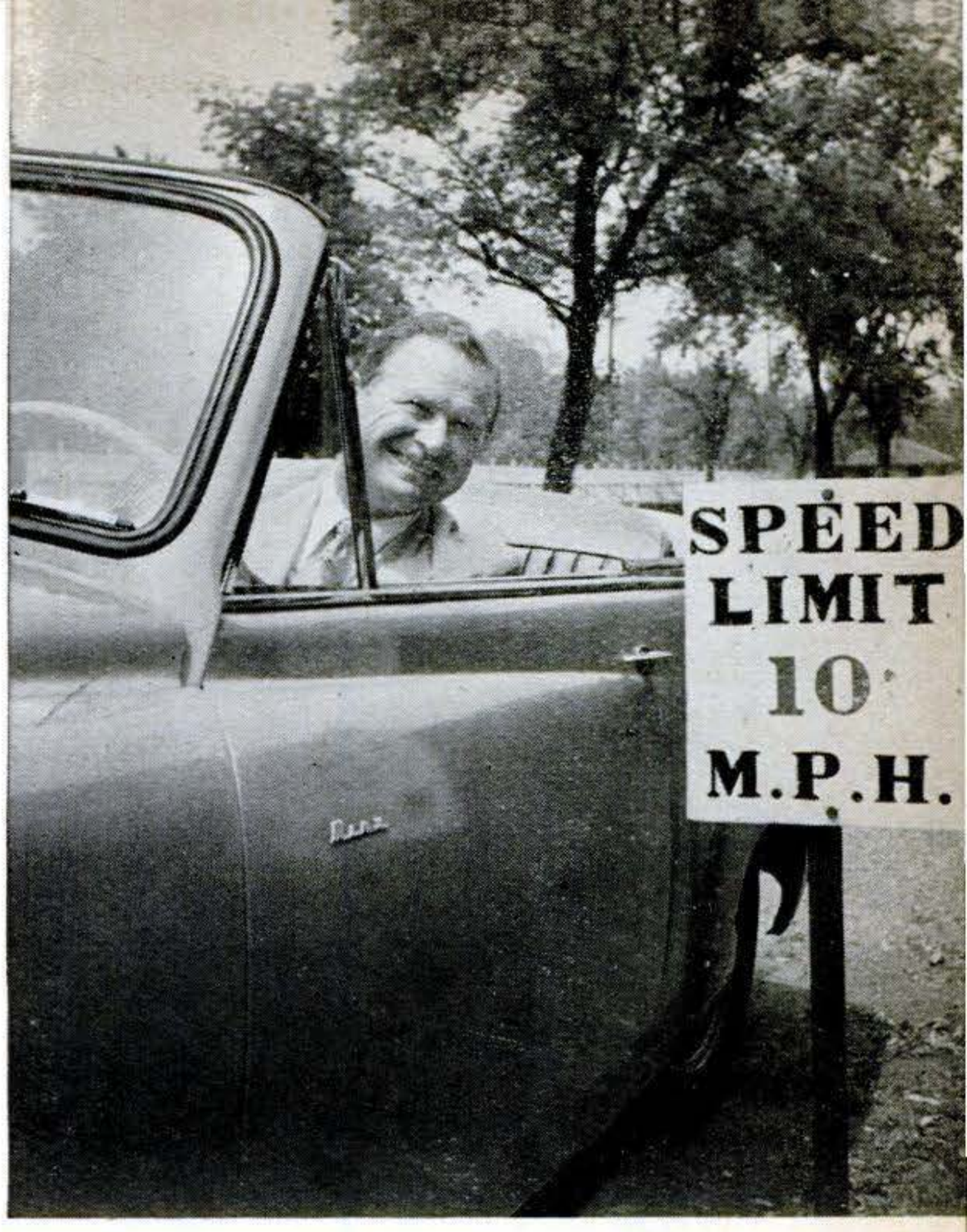
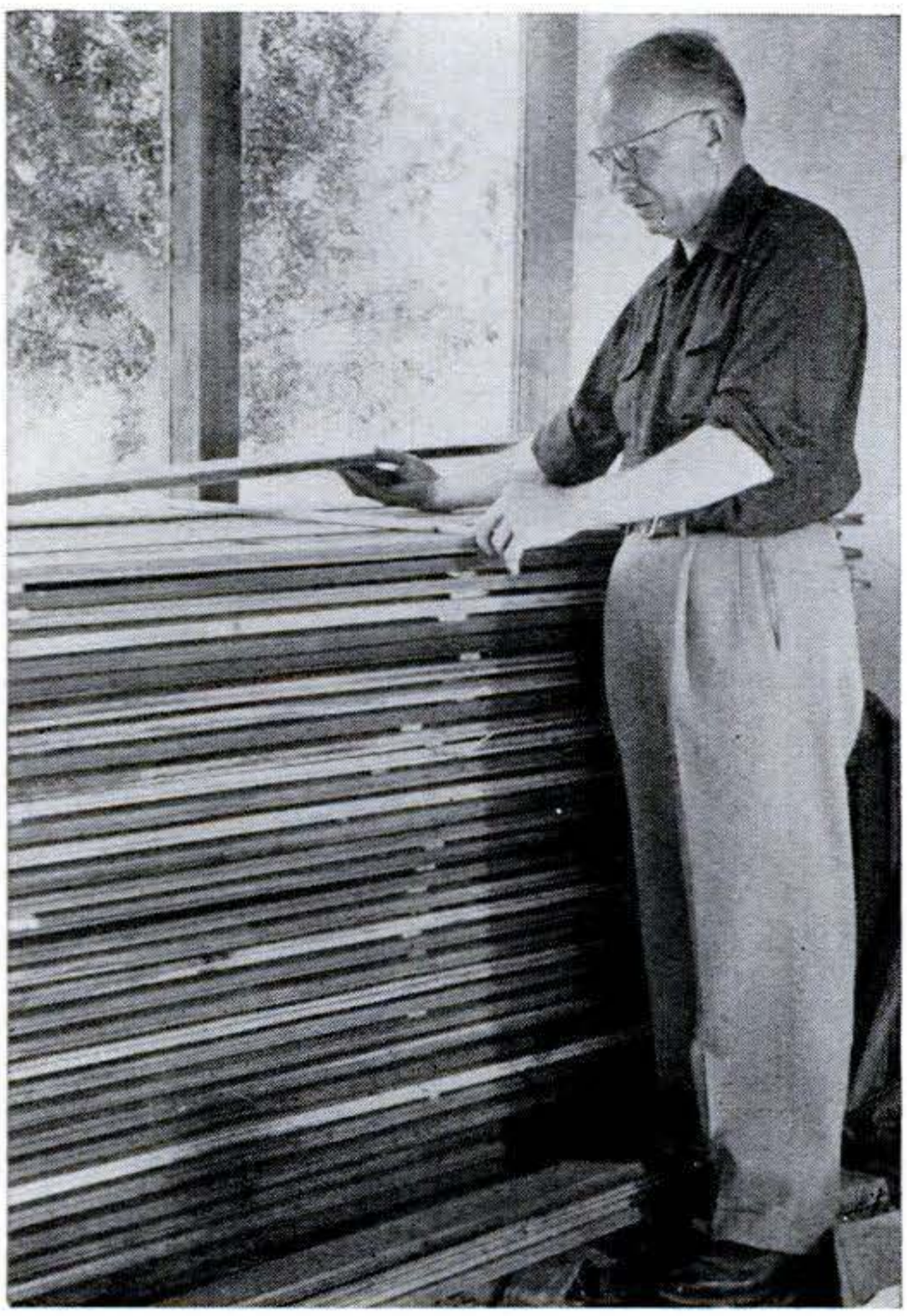
Popular Science *Highlights* This Month

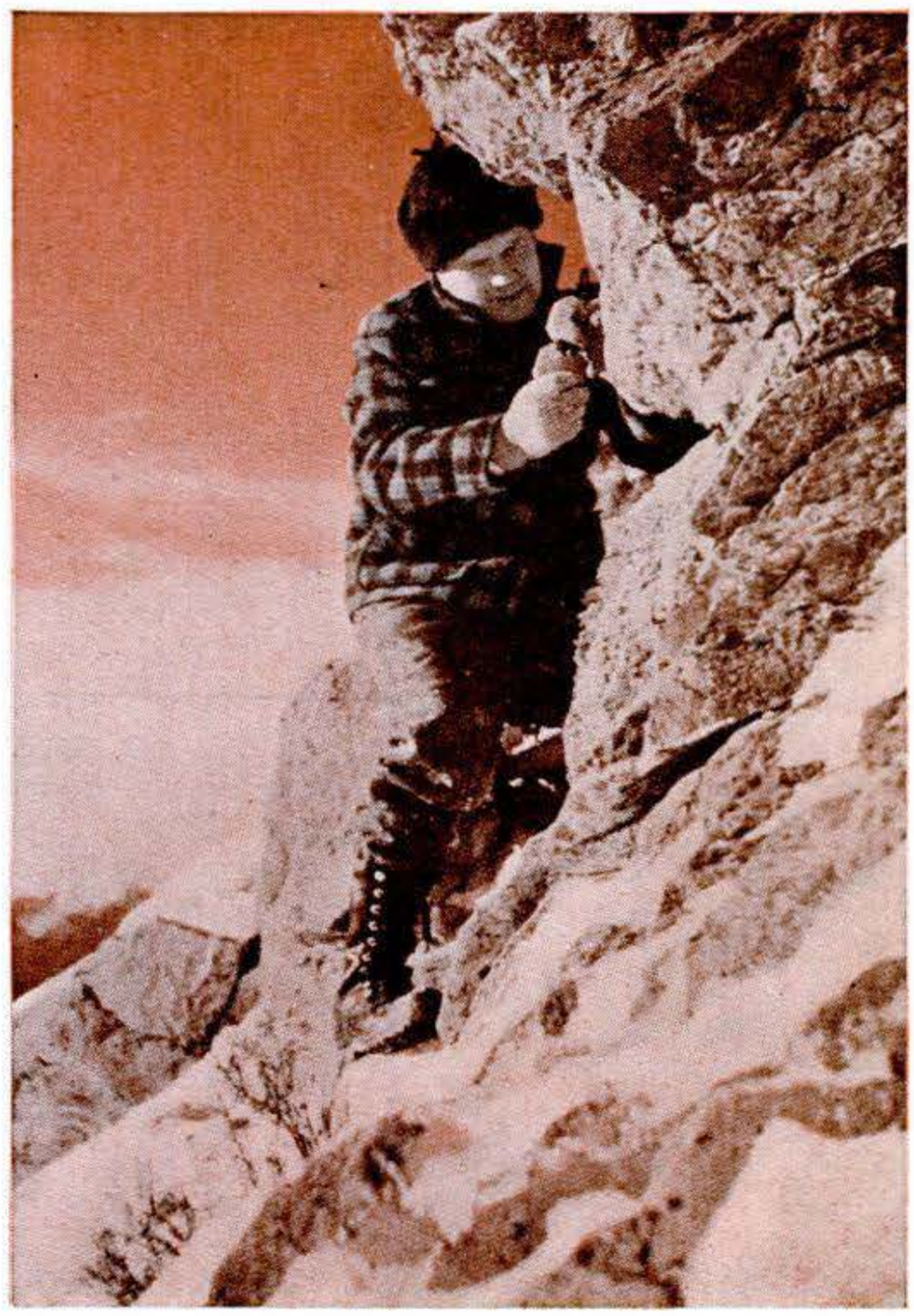
Starting a balky engine on a cold winter morning can be a mean job—if you don't know how. Find out ahead of time why engines balk and what you can do about it. **Page 189**



Wilbur Shaw tries out the Hillman Minx. But don't let that speed sign fool you: He reports the little British car cornered fine at 60 on the Indianapolis Speedway. **Page 124**



Green lumber can save you money if you know how to use it. Dried in your back yard or even nailed up to cure in place, it can do the job of expensive, commercially seasoned lumber. **Page 177**



This oil-seeking geologist is one of the men sparking a great industrial boom in wild northwestern Canada, where a vast power project will help make aluminum in a frontier fishing village. **Page 98**

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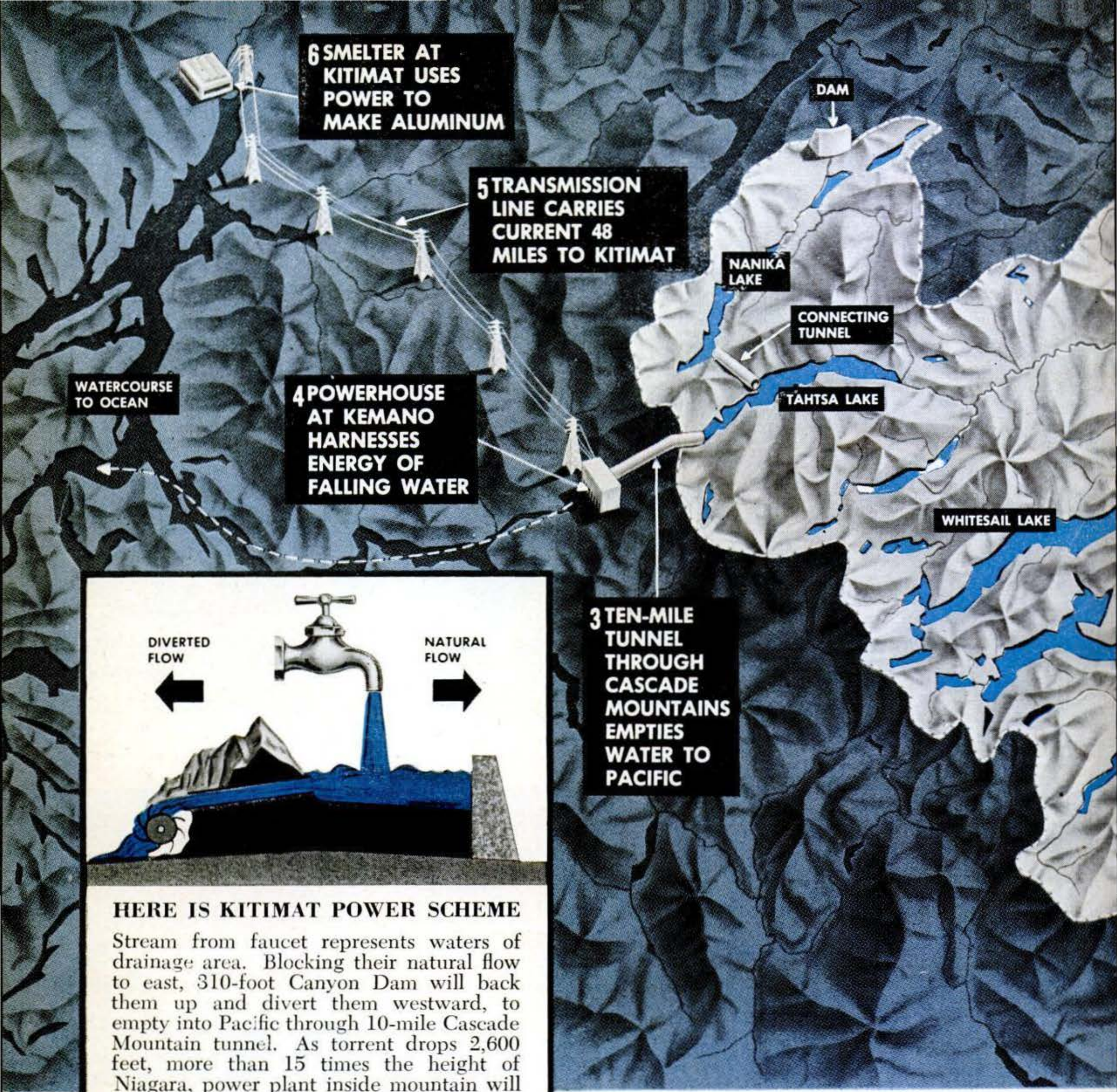

HERE IS KITIMAT POWER SCHEME

Stream from faucet represents waters of drainage area. Blocking their natural flow to east, 310-foot Canyon Dam will back them up and divert them westward, to empty into Pacific through 10-mile Cascade Mountain tunnel. As torrent drops 2,600 feet, more than 15 times the height of Niagara, power plant inside mountain will develop up to 1,600,000 horsepower.

World's biggest aluminum smelter at Kitimat, British Columbia, will draw power from mighty

Engineers Invade Another Wilderness

Huge Canadian power project marks 20th Century frontier boom.

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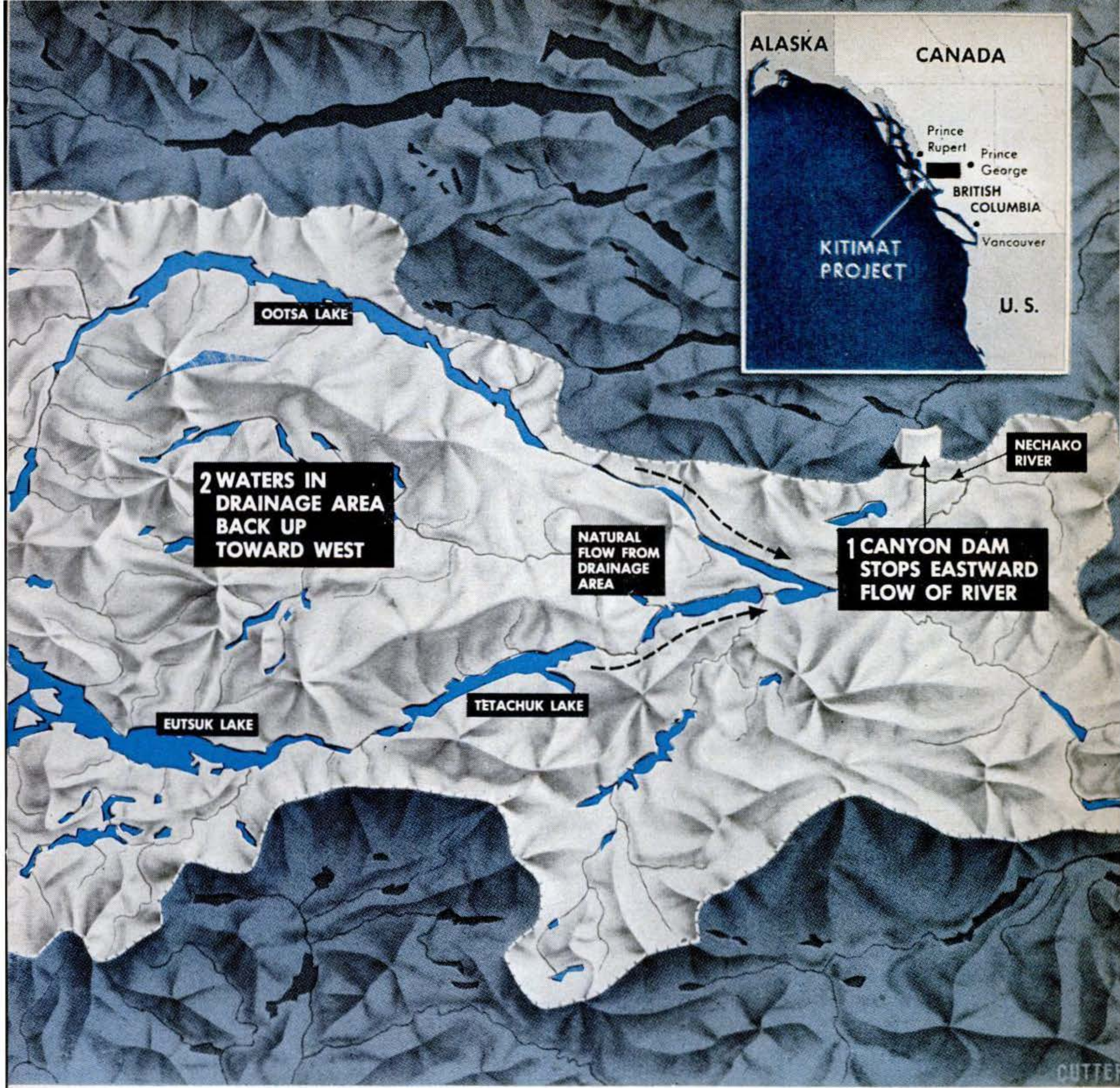

hydroelectric plant at Kemano, where diverted waters of light-shaded drainage area will be harnessed. Location of territory shown above is indicated by black oblong on inset map.

By Richard L. Neuberger

IT'S like the old gold-rush days again. Boom towns. Adventurous men carving civilization out of the wilderness. But not for gold this time. Now they are after commoner yet more valuable things—electricity, wood, minerals and oil.

Can 230,000-volt transmission lines be erected on glacial ice and silt? A year of difficult tests has proved that they can. As a result, engineers now plan to reverse the flow of a chain of huge wilderness lakes in the uplands of British Columbia and thus produce more water power than the Bonneville, Shasta and Muscle Shoals projects combined. These transmission towers will carry power to the world's largest aluminum smelter.

This prodigious feat, undertaken by the Aluminum Company of Canada, will be the biggest hydroelectric project ever financed with private capital. It will generate more electricity than any other plant in operation except Grand Coulee Dam.

Soon the Nechako River, which few but the hardiest men have ever navigated, will be plugged with a dam 310 feet high and

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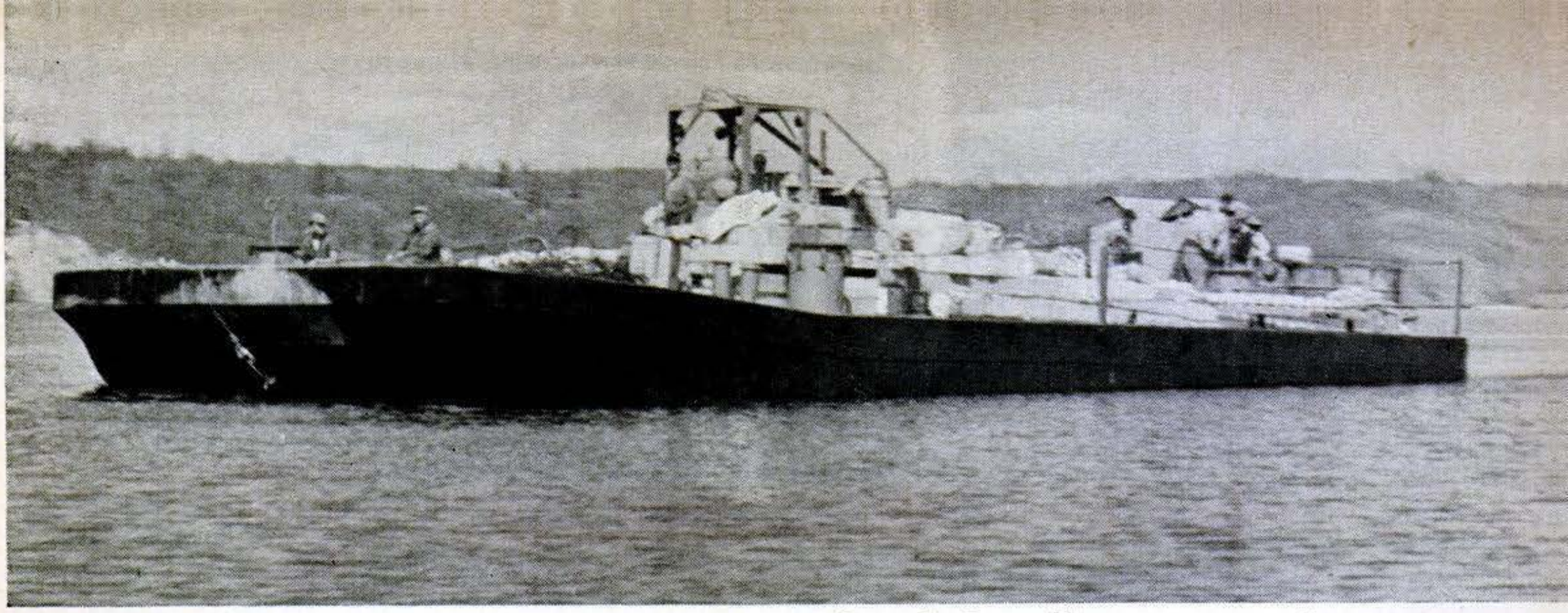


Steel barges like this one, starting a trip up Ootsa Lake and Tahtsa River, furnish transportation through the wilderness to site of water-diverting tunnel for the Kitimat power project.

1,350 feet long. This dam will generate no kilowatts, but will back up the flow of many large lakes that feed the Nechako.

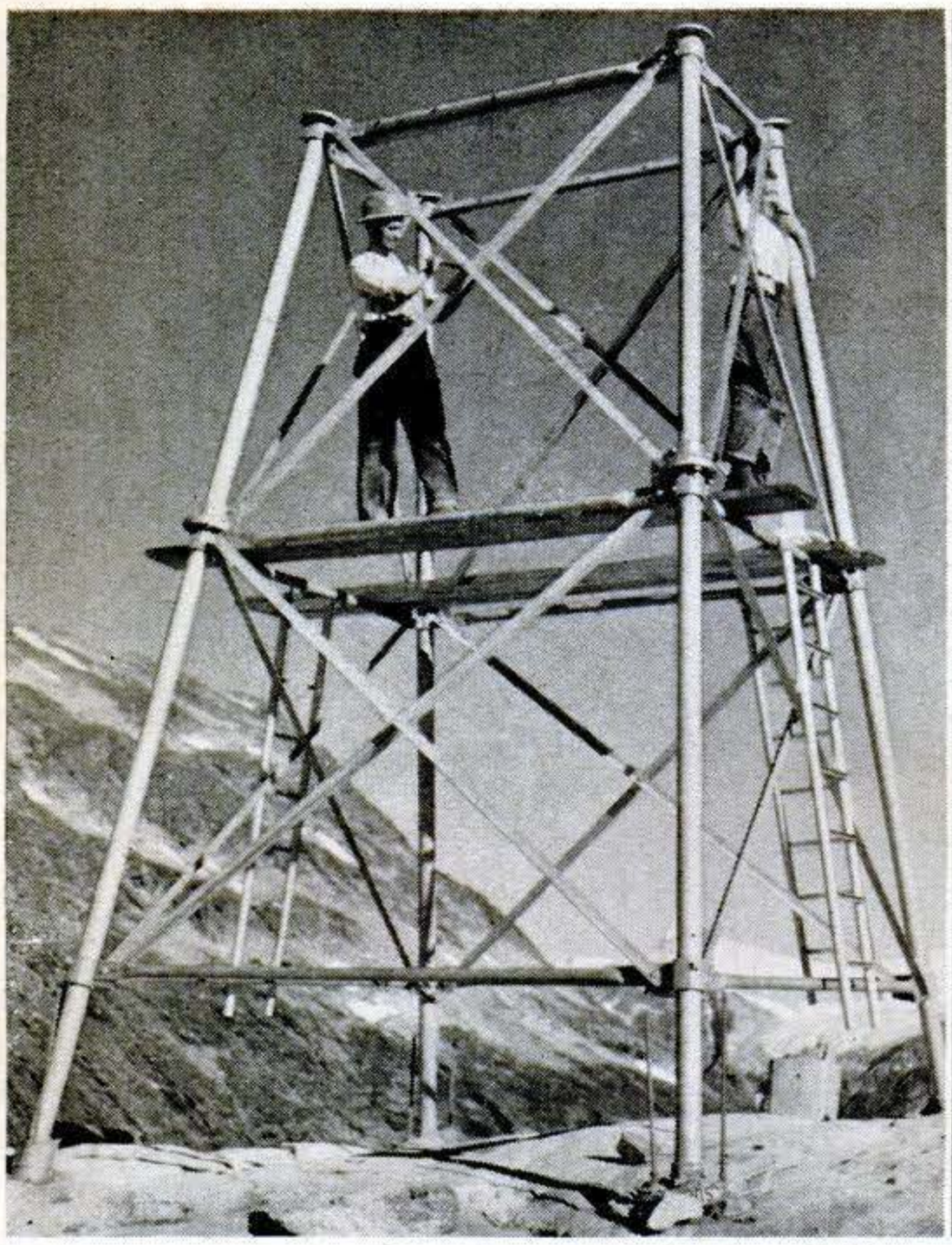
Since the glacial sheets of the Pleistocene Epoch, these lakes have discharged eastward, into the Fraser River watershed. But Canyon Dam on the Nechako will impound them in a reservoir lapping against the Coast Range, off to the west.

At the most westerly lake, wind-rippled Tahtsa, a tunnel 10 miles long will be punched through the mountains. The tunnel will drop the water 2,600 feet to sea level at the head of Kemano Fiord.

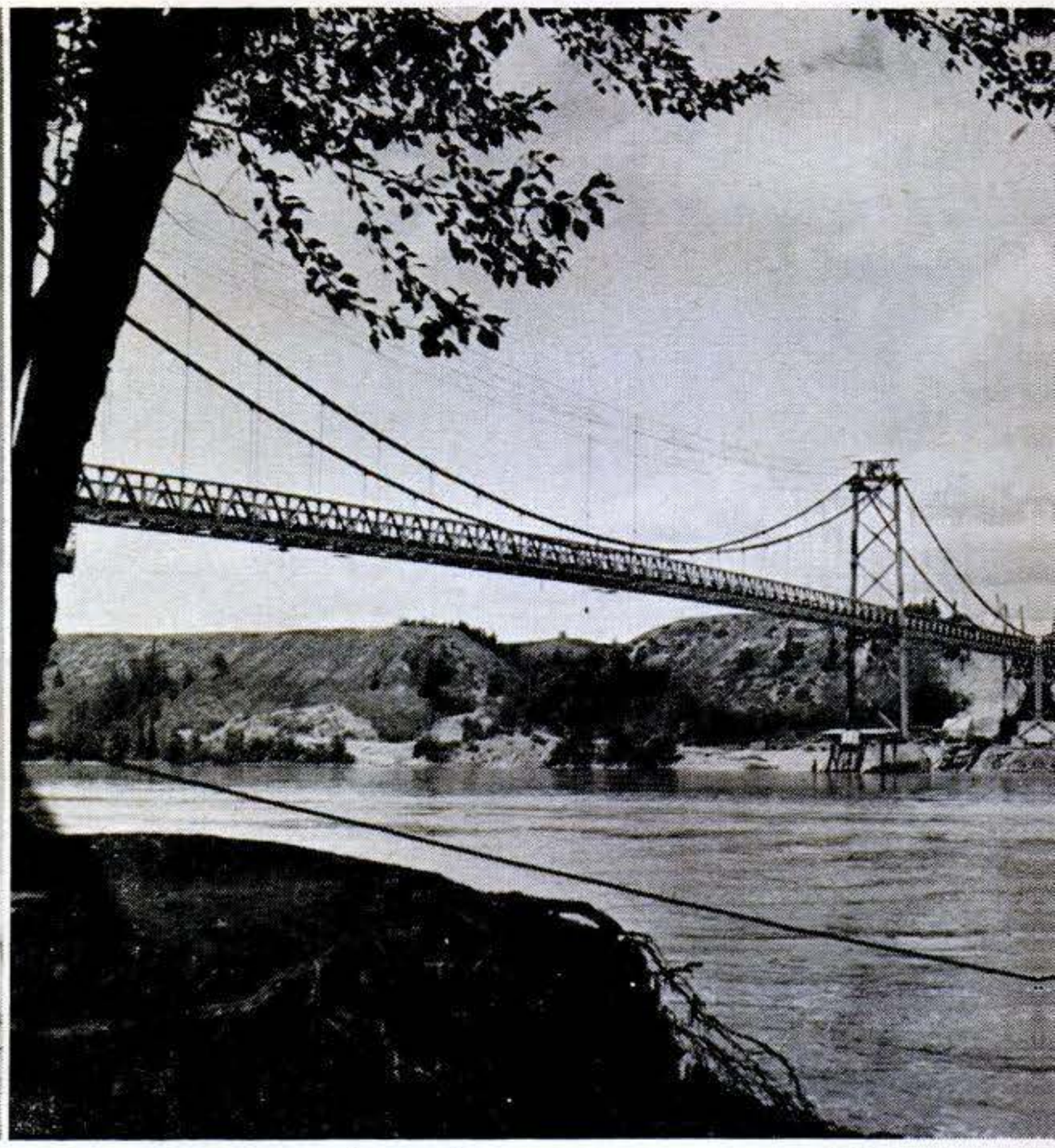
In a vast man-made cavern inside the granite cliffs at Kemano, a hydroelectric plant capable of producing 1,600,000 horsepower will be built.

Since there is no room at cramped Kemano for a factory, the electricity will be transmitted 48 miles across mountains and over glaciers to Kitimat, at the end of a more spacious fiord.

Kitimat is now an Indian fishing village.



Test transmission tower is erected on rock left behind by glaciers in Coast Range between Kemano and village of Kitimat, where a 48-mile line will carry power at 230,000 volts.



Alaska Highway leaps Peace River on graceful suspension bridge at road's starting point in British Columbia. Span is being strengthened for increasing traffic of new industrial boom.

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Aluminum huts shelter workers on project to produce more aluminum. Men at "Thirty-Mile-Camp" (above) are building a road to site of projected 310-foot-high dam on Nechako River.

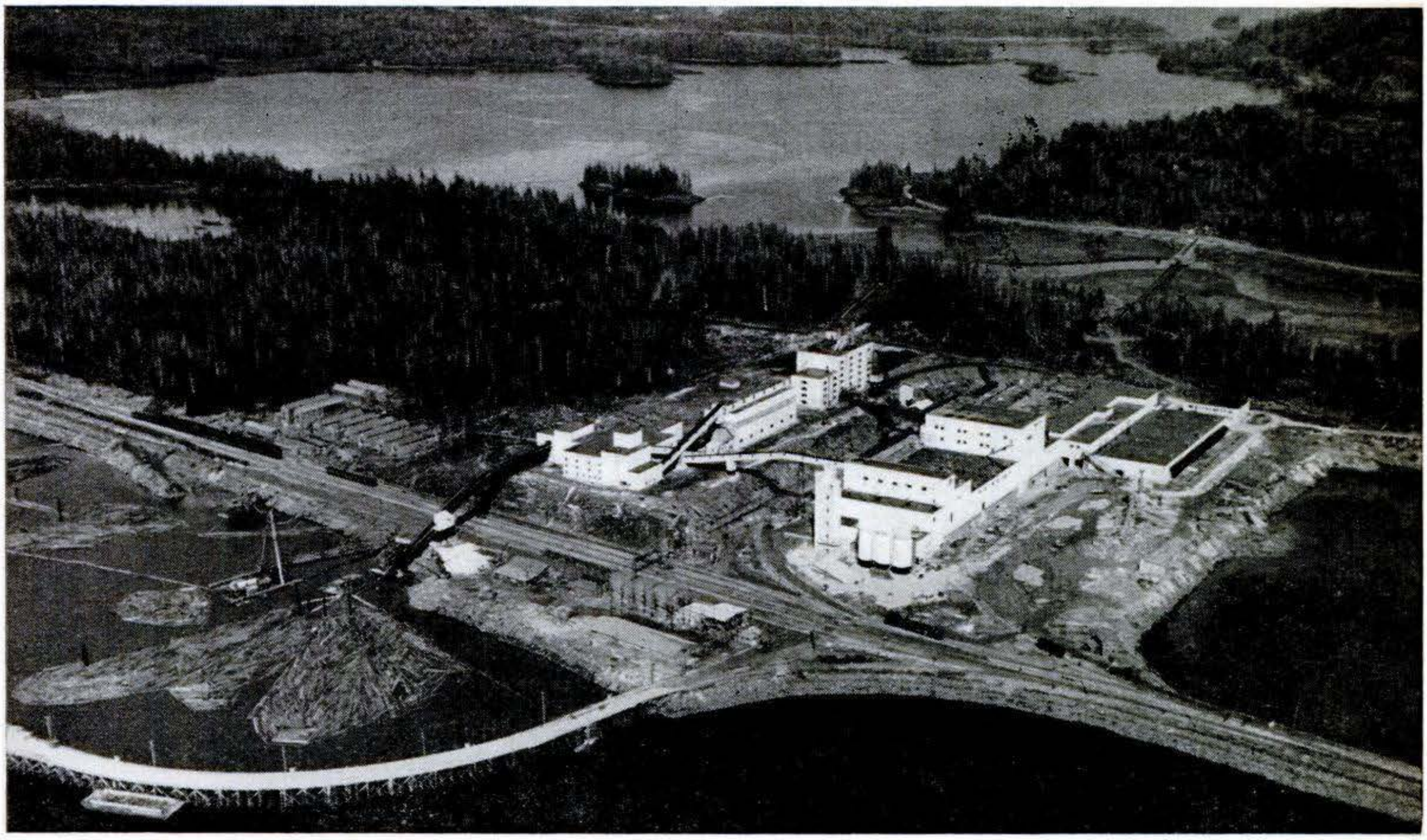
Eventually it will be the site of the largest aluminum plant in the world, with a capacity of more than 500,000 tons a year.

In some places the ice has been blasted away so that the steel transmission towers can be concreted directly on the lava rock below. Elsewhere the uprights can be sunk all the way through the glacier to a firm foundation.

The whole undertaking will cost the Aluminum Company of Canada an ultimate $500,000,000. Yet power costs at Kitimat will be only one cent for each pound of aluminum. Power costs nearly three times as much at some of the new plants along the Gulf Coast in the United States. And electricity is the principal factor in the production of aluminum.

In the granite and fir fastnesses of Tweedsmuir Park, a reserve more extensive than Yellowstone, the vast hydroelectric project has begun. Already the Morrison-Knudsen Construction Co. has bulldozed

[Continued on page 259]



Great new pulp mill, symbolizing British Columbia's treasure chest of natural resources, will yield raw material for 200,000,000 pounds of yarn and fiber yearly—equivalent to 15 percent of wood pulp used by entire rayon industry in U. S. In foreground of picture, log rafts may be seen beyond curving dock where U. S. Army once loaded blockbusters for South Pacific.

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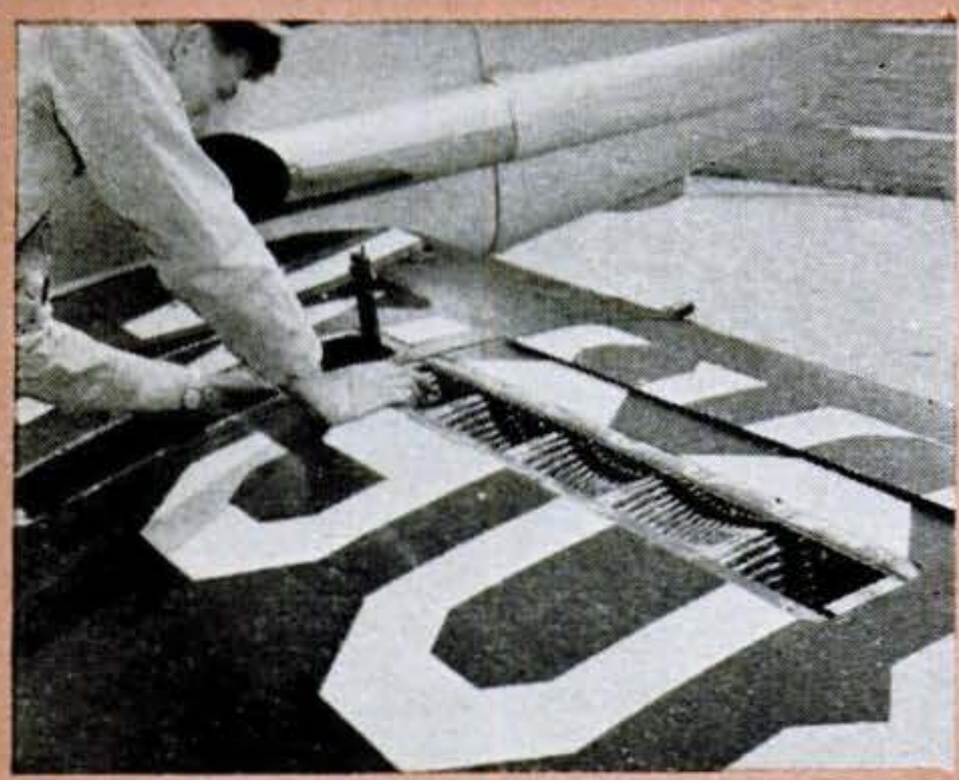


Machine-gun ammunition for flivver fighter is loaded through door in top of wing. Defender has range of 560 miles with auxiliary fuel tanks on tips of wings.

Flivver Plane Totes Guns, Bombs

A PLANE no bigger—and no faster—than the flivvers seen by the thousands on the nation's civilian airports is being considered by the Army as a support weapon for ground troops. Known as the Defender, it weighs only 1,160 pounds empty and cruises at 144 miles an hour—less than a fourth the speed of today's jet fighters.

If accepted as part of a put-put air force, it would oppose the trend toward bigger

Army's New Vehicle Can Be Bus, Ambulance, Truck—or All Three

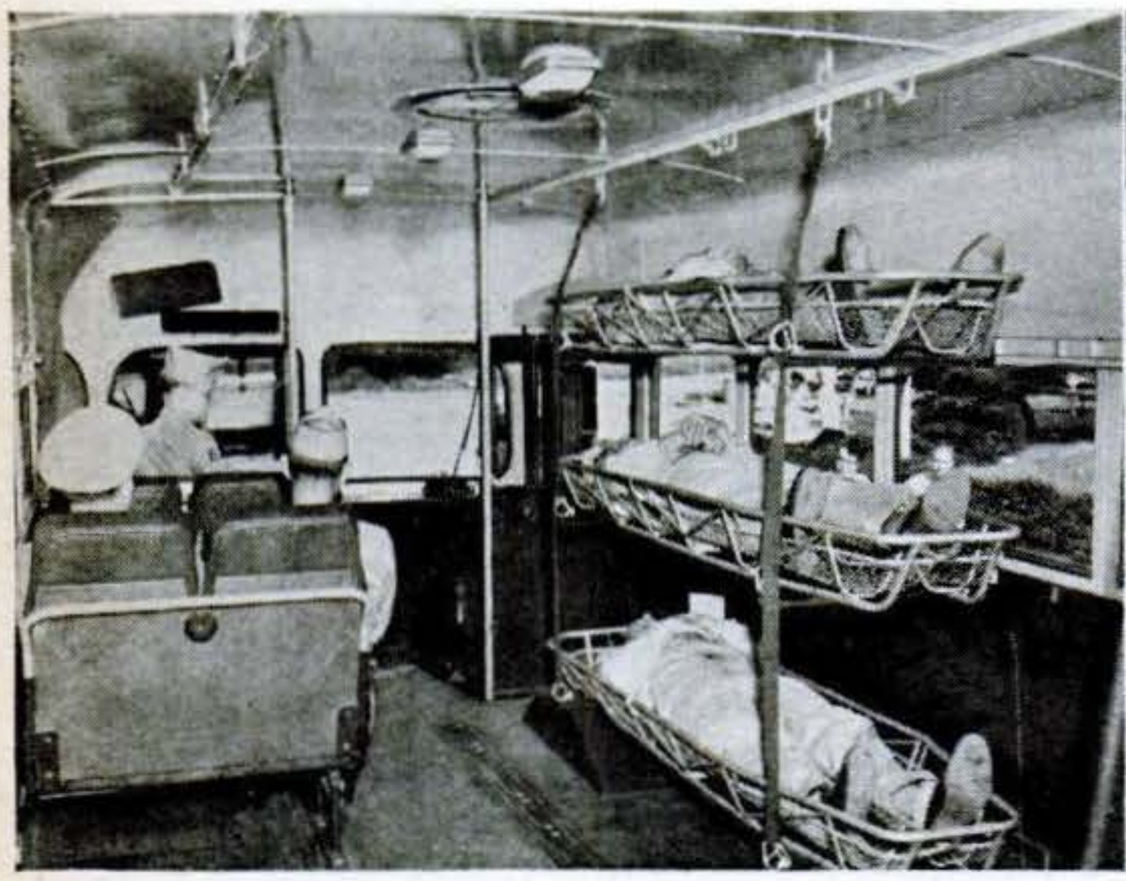
Now the Army has come up with a changeable chariot that does triple duty as a bus, truck, ambulance or all three at one time.

The new military transportation unit demonstrated its all-around usefulness in a recent tryout before Pentagon officials in Washington.

In the interior view at the left below, it is doubling as a bus and motorized litter carrier.

In the right-hand photo a soldier in a wheel chair is being put aboard on a plank runway.

The vehicle can carry 37 passengers or 18 litter patients or five tons of cargo—easily loaded through the wide rear doors—or any combination of these loads.



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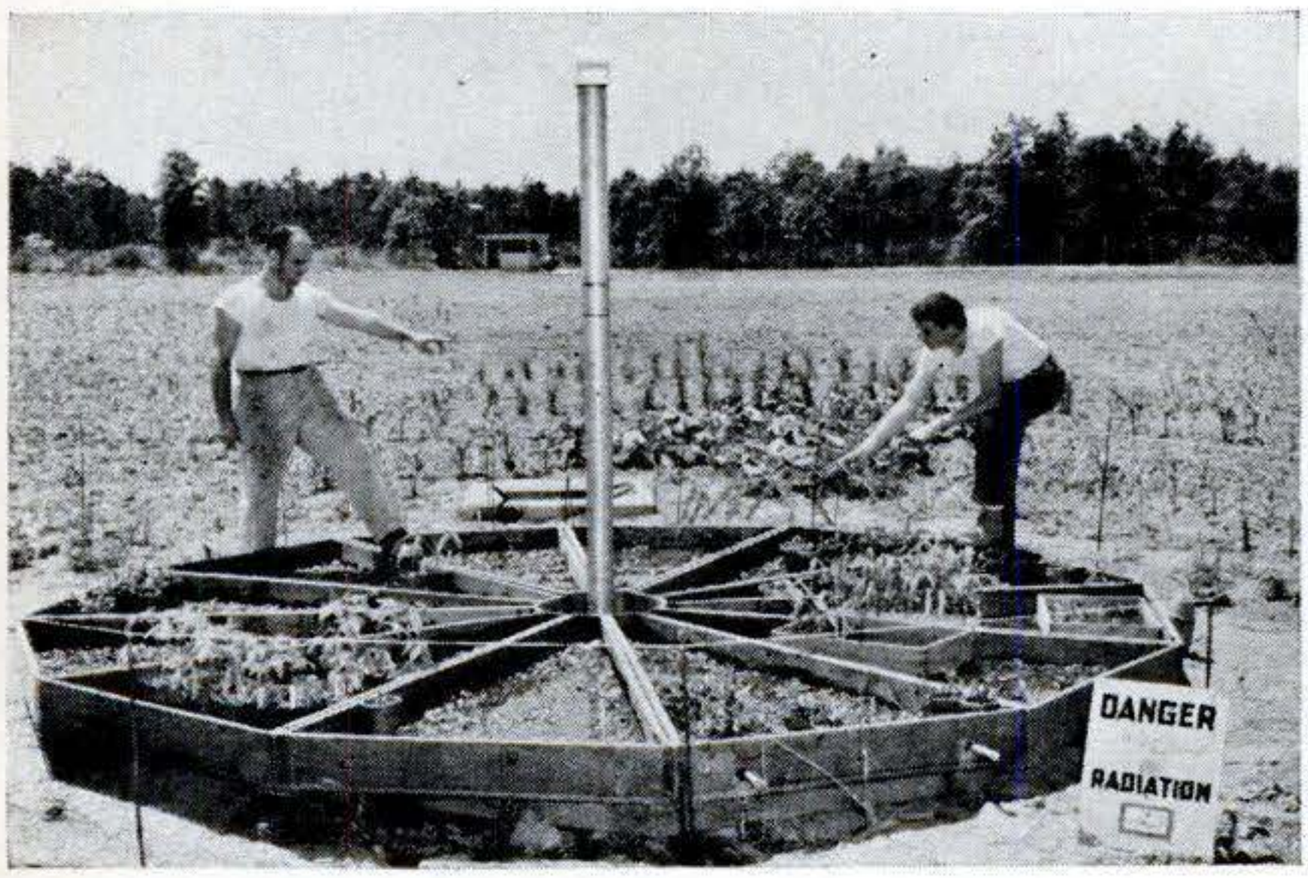
Weapons it can carry are lined up near experimental fighter at Quantico Marine Base.

and faster military aircraft. The Defender can carry napalm, bombs, rockets and guns to attack enemy troops. Built by the Fletcher Aviation Corp., Pasadena, Calif., it carries a 1,340-pound load, including pilot and 1,000 rounds of ammunition in the wings for two .30-caliber machine guns.

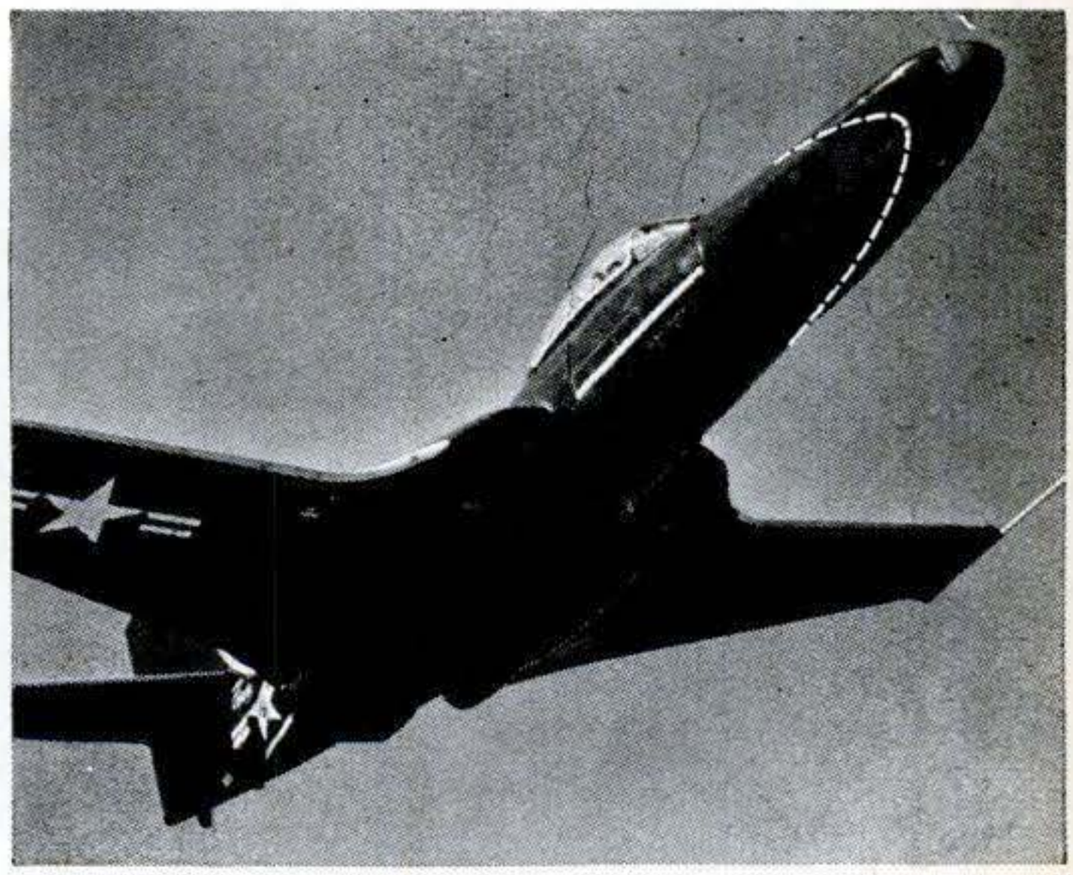
Radioactivity Improves Crops

THE big "wheel" below is part of an experiment to produce better crops by exposing different plant growths to radioactivity at Brookhaven National Laboratory in Upton, N. Y. The radiation alters cell structures and produces other changes for cross-breeding much faster than nature normally would do it. The pipe contains radioactive cobalt.



Navy Jet Carries Cameras

HERE is the Navy's new F2H-2P Banshee —first jet photographic plane developed for carrier use. The extended nose on the model below houses six types of cameras, which can be interchanged for various photographic missions. Now in production at the McDonnell Aircraft Corp., the plane is a modification of the Navy's 600-m.p.h. twin-jet Banshee fighter.



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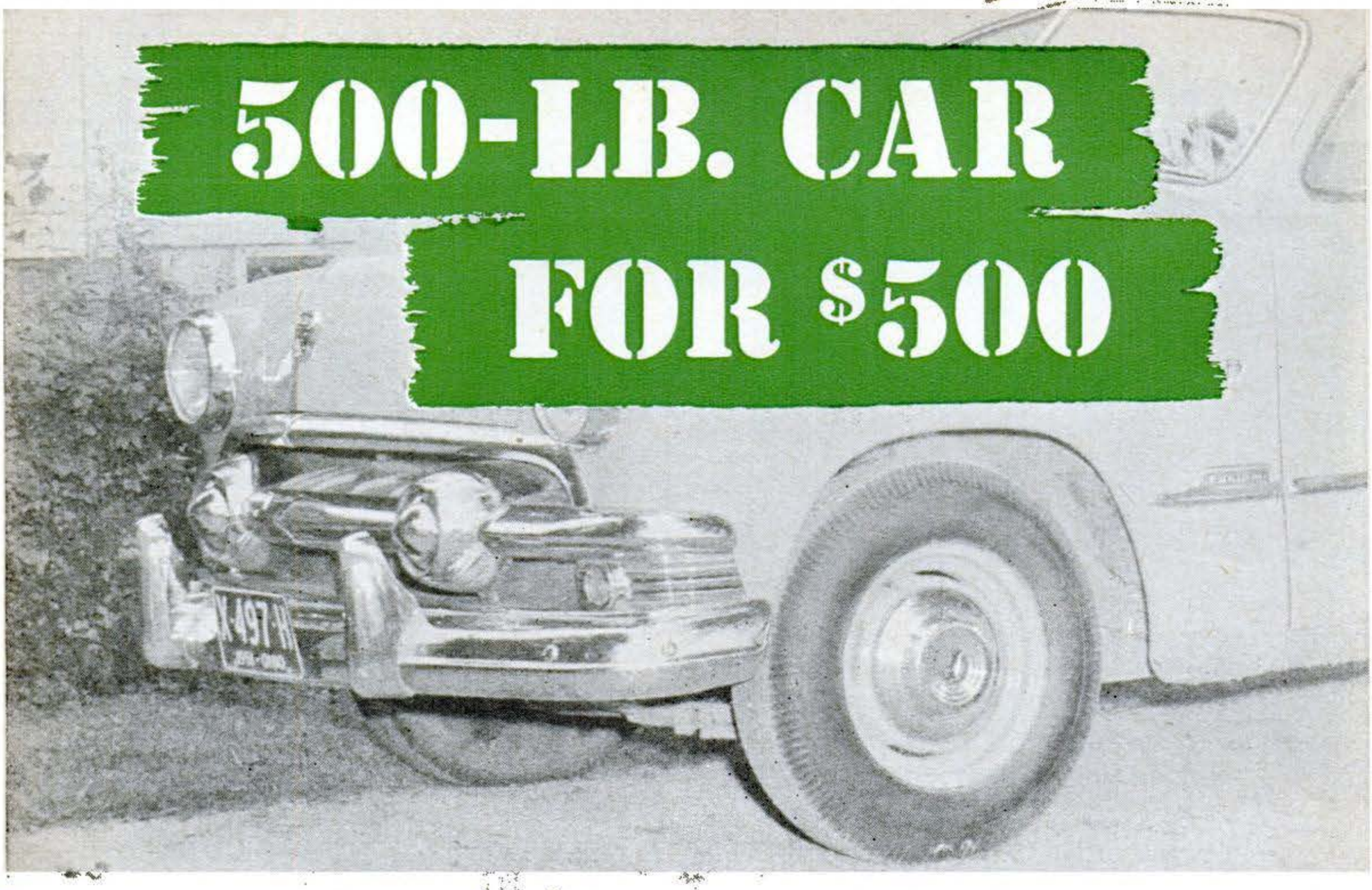
500-LB. CAR FOR $500



There's room in one driveway for a standard car and this two-seater, too. With a 72-inch

This one-cylinder midget, designed by former airmen, has a two-speed automatic drive. It can be bought unassembled, or in a crate ready to run.

By Harry Walton

IN a small Ohio town a couple of ex-fliers are turning out a two-passenger car you can buy for about $400, before taxes and trimmings. Things like fenders, windshield, top and bumpers are considered extras, but even they leave the price tag on speaking terms with $500.

The car is really practical. It will run a dozen errands and still give you change out of a buck at the gas pump. As I found by driving it, it will climb steep grades, make better than 40 on the highway, squeeze into a substandard parking space, and ride out real bumps. It will seat two husky passengers and take a couple of armloads of packages as well.

Anybody can drive it. If you have an able-bodied maiden aunt who never got the hang of the old electrics, you can teach her to drive the King Midget in five minutes. There's no clutch pedal, no gearshift lever, no Greek-lettered selector quadrant. You drive with one foot—which controls an honest-to-goodness two-speed transmission.

All you do to start up is step on the gas. After a short run in low, you let up for a moment, press down again, and pick up in high—just as in the latest automatic jobs. Downgrade, the engine gives compression braking down to about 15 m.p.h.

Climbing hills, the engine stays in high until it drops considerably below the cut-in speed. Then it shifts to low and keeps right on. You can't forget to shift, and you can't stall the engine.

Who makes it? The King Midget got off to an imperceptible start when two pilots met in the Civil Air Patrol. Both were machinists by trade; both had built their own planes, as well as cars and motor scooters. And both wanted to manufacture something with an engine in it.

Chunky, blue-eyed Dale Orcutt dreamed of turning out planes at first, for both pilots had ideas about aircraft design. But Claud Dry, once an aerial photographer and operator of a small airport, was less optimistic

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wheelbase and a 42-inch tread, it fits into a space only 48 inches wide and 8½ feet long.

about private flying. Inevitably the talk got around to midget cars.

The partners decided to keep their feet on the ground. In 1945 they bought out a defunct motor-scooter factory, named their new firm Midget Motors Supply, and established their plant in Athens, Ohio.

By 1946 they had designed a single-passenger midget racing car and bought out two more scooter plants. A powerful scooter of their own design was a success and is still in production. But their dream was to build a small two-passenger car.

The difficulties loomed large. A differential would boost costs formidably; would one-wheel drive do? Could a really light car be roadworthy? Could a mechanical starter be devised, saving the price of a complete electric system? Nine test cars were built—at the price, they ruefully assert, of 12 Cadillacs. One was hastily junked; others revealed basic design headaches.

It's no scale model. They found the answers in their knowledge of small-plane construction, and in their own ingenuity. If you just scaled down a big car, they reasoned, you'd wind up with a small one that was almost as complicated and costly.

The new car had to be planned from a fresh start. One-wheel drive was found to be effective if car weight was properly distributed and springing right. The engine went in back, on the drive-wheel side. Rope and pedal starting were discarded in favor of a retractable cable. This runs over pulleys, giving a two-to-one advantage, to a rack that meshes with a pinion on the engine—but only when you pull the cable.

Simplicity, patented. The King Midget is starkly simple where it doesn't hurt, but significant details aren't skimped. For in-

Four can tote it. The car weighs less than 500 pounds, with most of this on the rear wheels. One man can slide the front end to get the midget in or out of a tight space.

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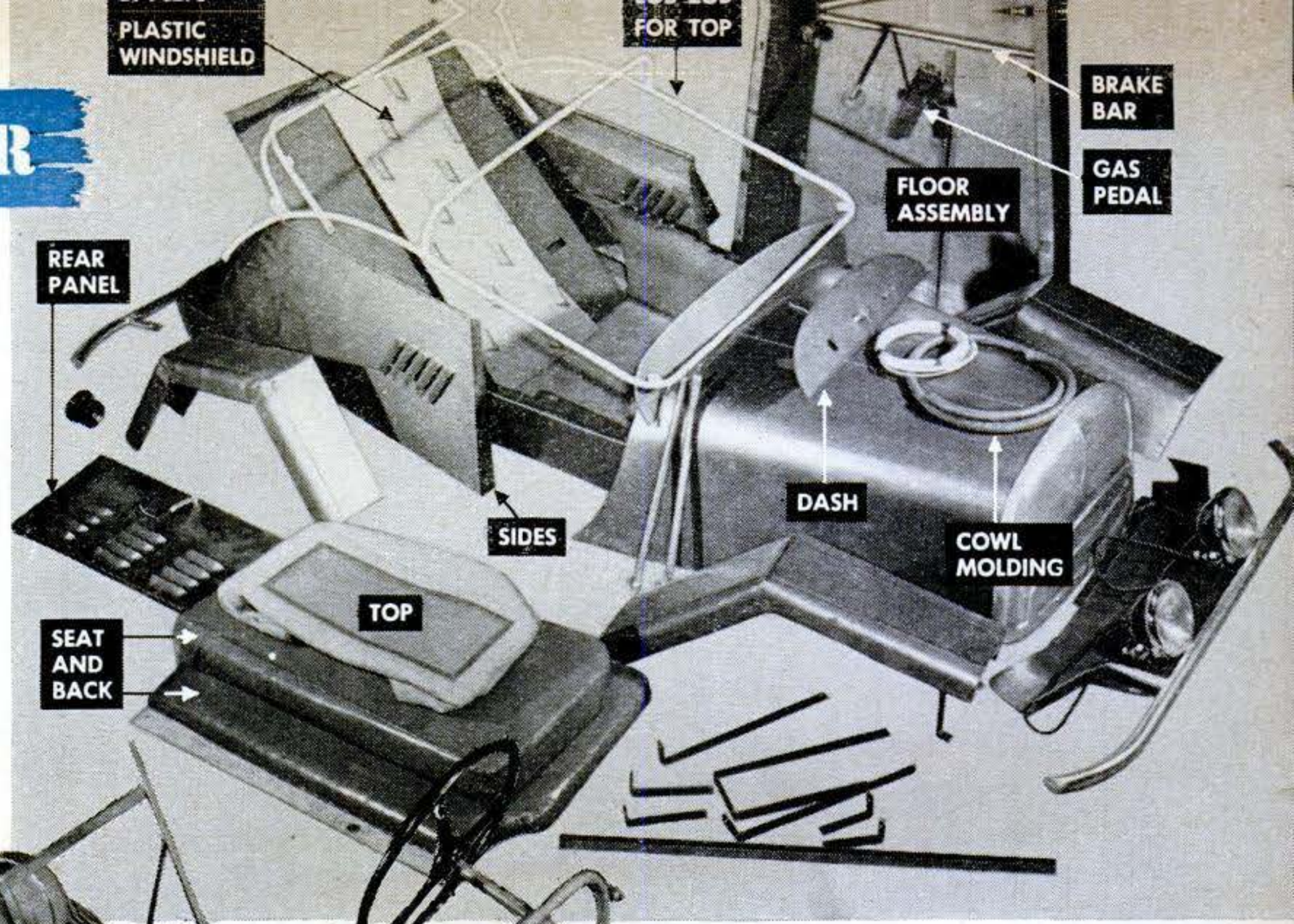
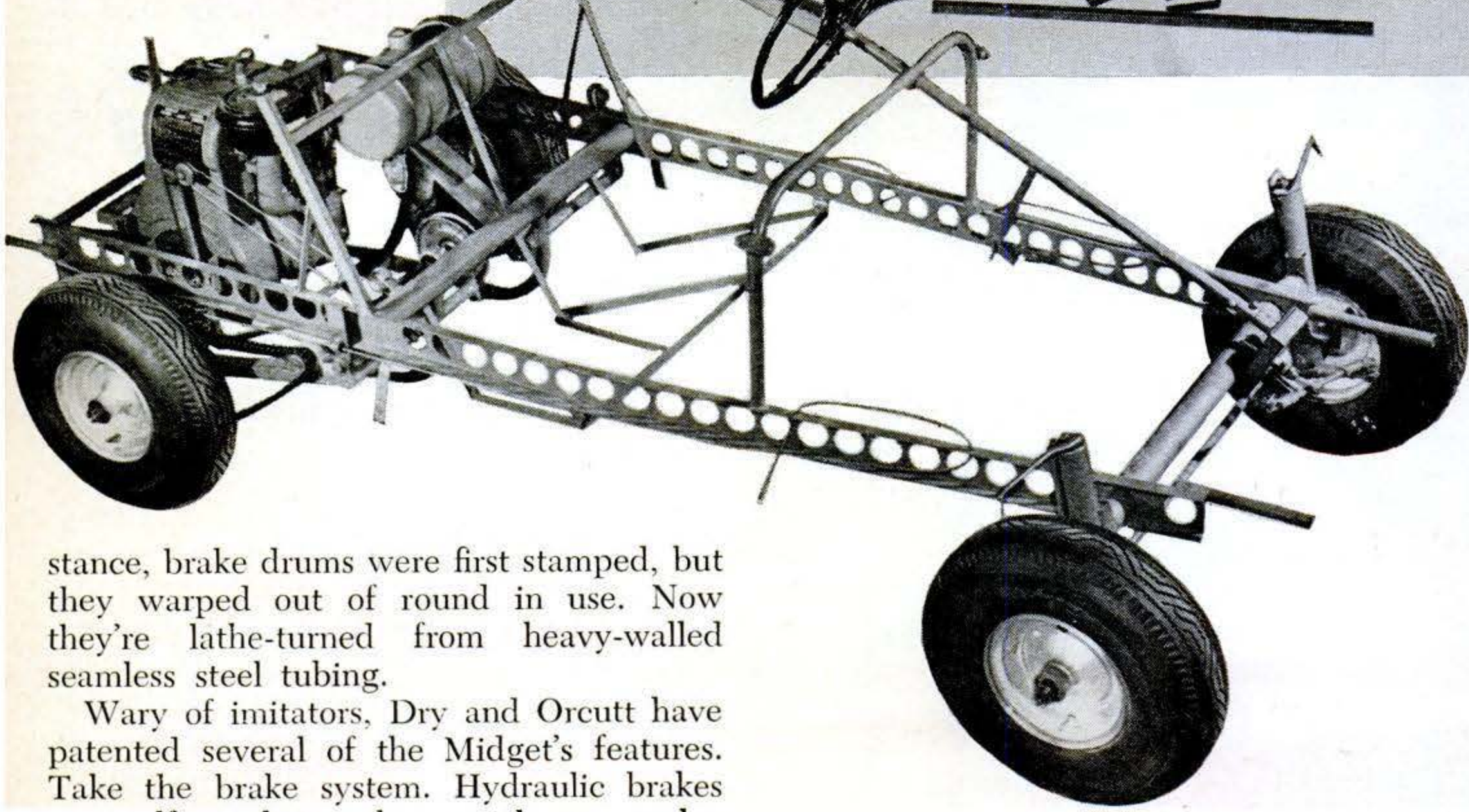
500-LB. CAR



You can buy it knocked down. Metal parts of the body (right) are steel. Fenders, bumpers, cloth top and plastic windshield are extra. Basic unit is the welded frame, of seamless steel tubing and airplane-type channel, shown below with wheels and engine. Buyer needs only common tools.



stance, brake drums were first stamped, but they warped out of round in use. Now they're lathe-turned from heavy-walled seamless steel tubing.

Wary of imitators, Dry and Orcutt have patented several of the Midget's features. Take the brake system. Hydraulic brakes are self-equalizing but costly to make. Mechanical brakes are troublesome to equalize, hard to keep that way. Wanted: self-equalizing mechanical brakes.

The King Midget has internal-expanding brakes actuated by cables. But the gimmick is in the cable rigging. It runs from one brake to a pulley near the driver's feet, across the car, around another pulley, and back to the other brake. These pulleys are mounted on the ends of a pivoted bar to which the pedal is welded. The bar multiplies pedal leverage, while the cable, free to move over the two pulleys, equalizes itself at all times.

The hand brake is a simple lever working on the toggle principle. When thrown so that the cable pull is just past dead center, it holds positively—without tooth or ratchet.

Power plant. Inside this little bus is a one-cylinder, 23-cubic-inch Wisconsin engine. But there's no one-lung jerkiness to the car. Pickup is smooth, and the shift to high quick and easy. The four-cycle engine is rated 7½ horsepower at the comparatively low speed of 3,000 revolutions per minute. It is air-cooled by a built-in blower (there's no radiator).

This engine boasts such features as roller crankshaft bearings and an oil-bath air cleaner. There are also a two-jet carburetor, automatic spark advance and impulsed-coupled magneto ignition. This last means you don't have to spin the engine like a whirling dervish to get a hot starting spark.

Standard starting equipment is the Yankee type—you yank a retractable cable on the

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Or they'll put it together for you, and paint it a standard cream finish. All parts except engine and wheels are made in Athens, Ohio, factory. Above is one of the assembly lines.

side of the car. Since you can't stall the engine, one start lasts a whole trip. You can get a battery-powered starter as an extra.

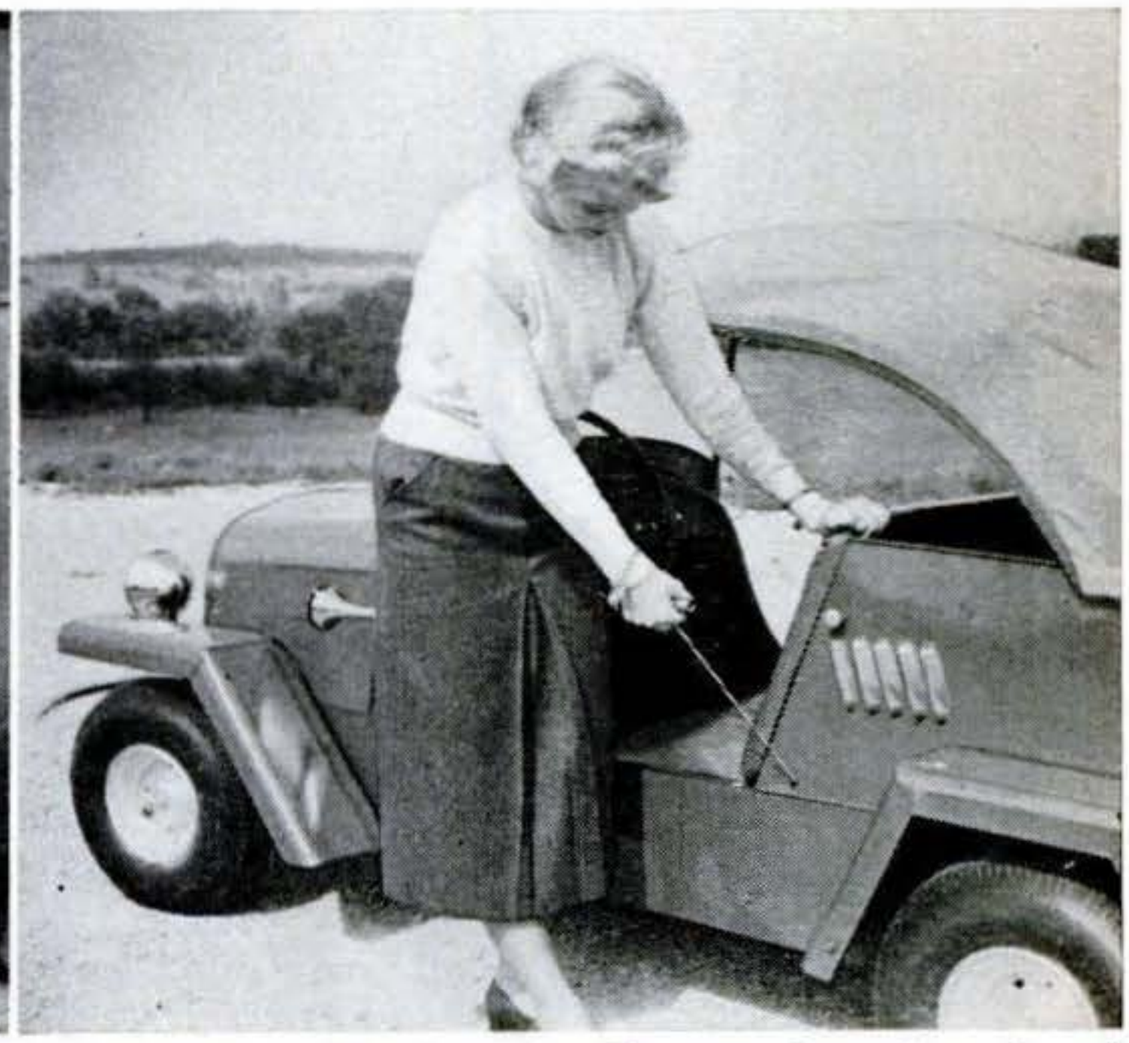
The engine holds three pints of oil, circulated by a pump. You switch from grade 30 in summer to 20 in winter. That's all the winter conditioning you do.

It shifts for itself. The car can be bought with a single-ratio automatic drive. This is a centrifugal clutch of special design that lets the engine outrun the drive for a quick getaway and pickup, and locks it in after the gas pedal is momentarily let up.

The two-speed transmission, listed as an extra, gives better pickup and hill-climbing ability, for it affords two distinct drive ratios. The car PS tried out had this transmission.

This patented drive gets results with a minimum of parts, complication and cost. It consists of dual V-belt drives, with pulleys of different ratios, and two automatic clutches. These operate somewhat like self-energizing brakes, engaging at a much higher speed than they will disengage at. The

Leg room is good, and you don't sit way down —seat is 9½ inches above floor. Although seat cannot be moved forward or back, brake and gas-pedal mounting can be adjusted to suit.



Starter cable has handle on driver's side of the body. Small button above louvers is the choke Cable retracts into body. Once the engine is running, you can't stall it.

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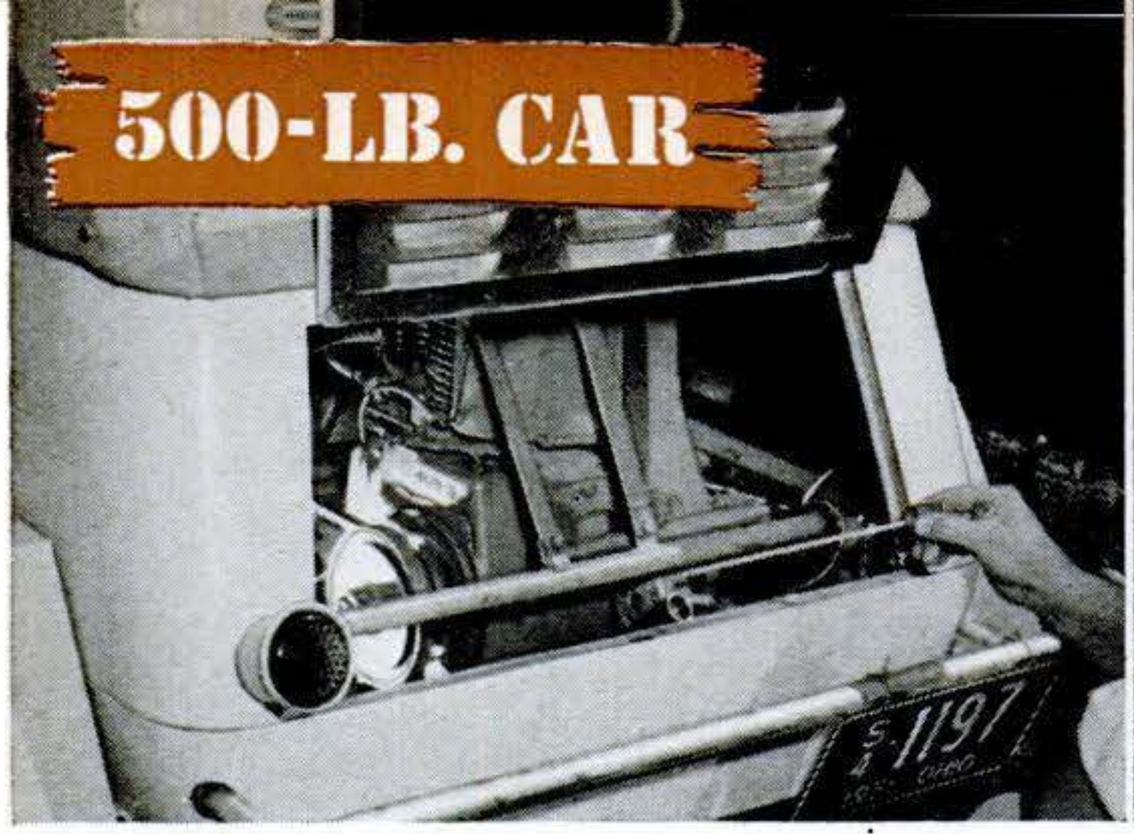
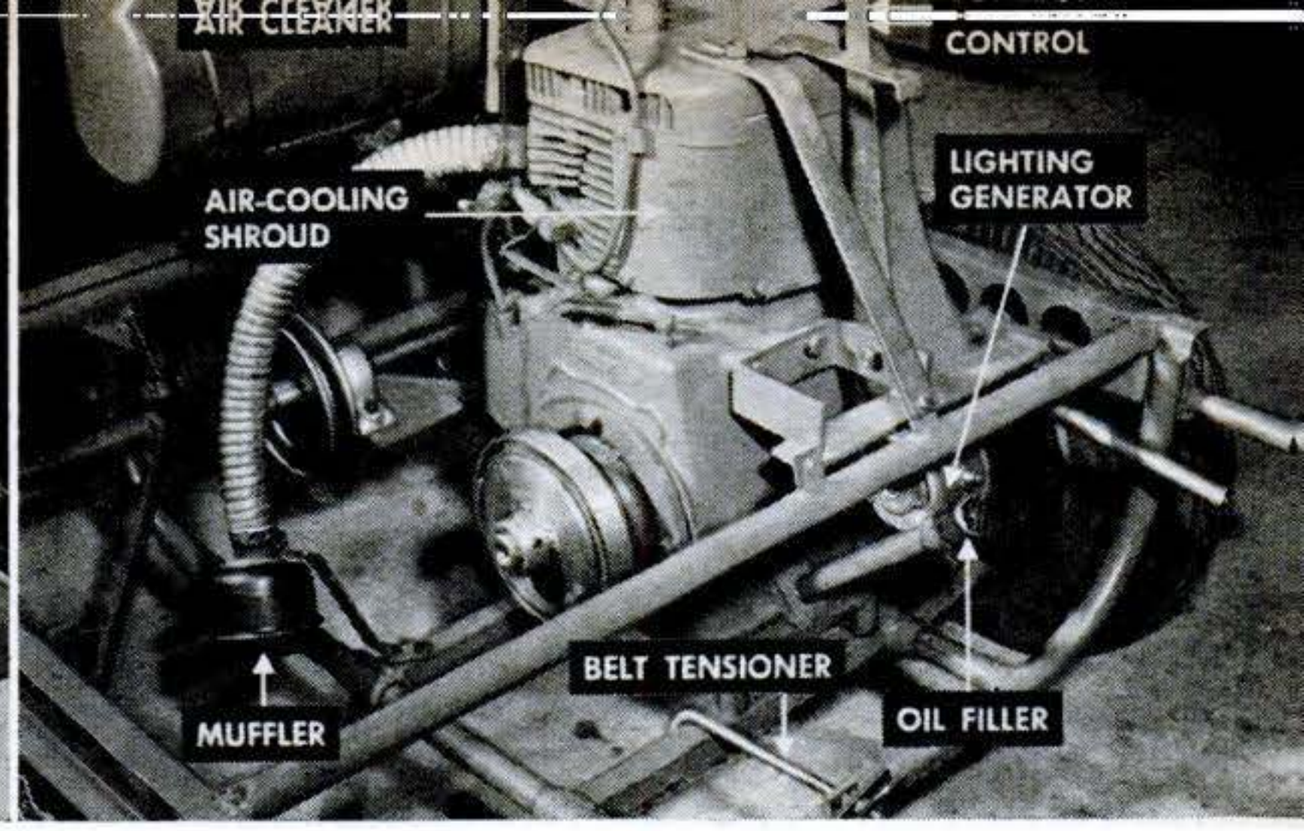


Oil is checked on a dipstick. Engine holds three pints. Being air-cooled, it requires no antifreeze in winter, only lighter oil. Spare tire goes on outside of rear panel.



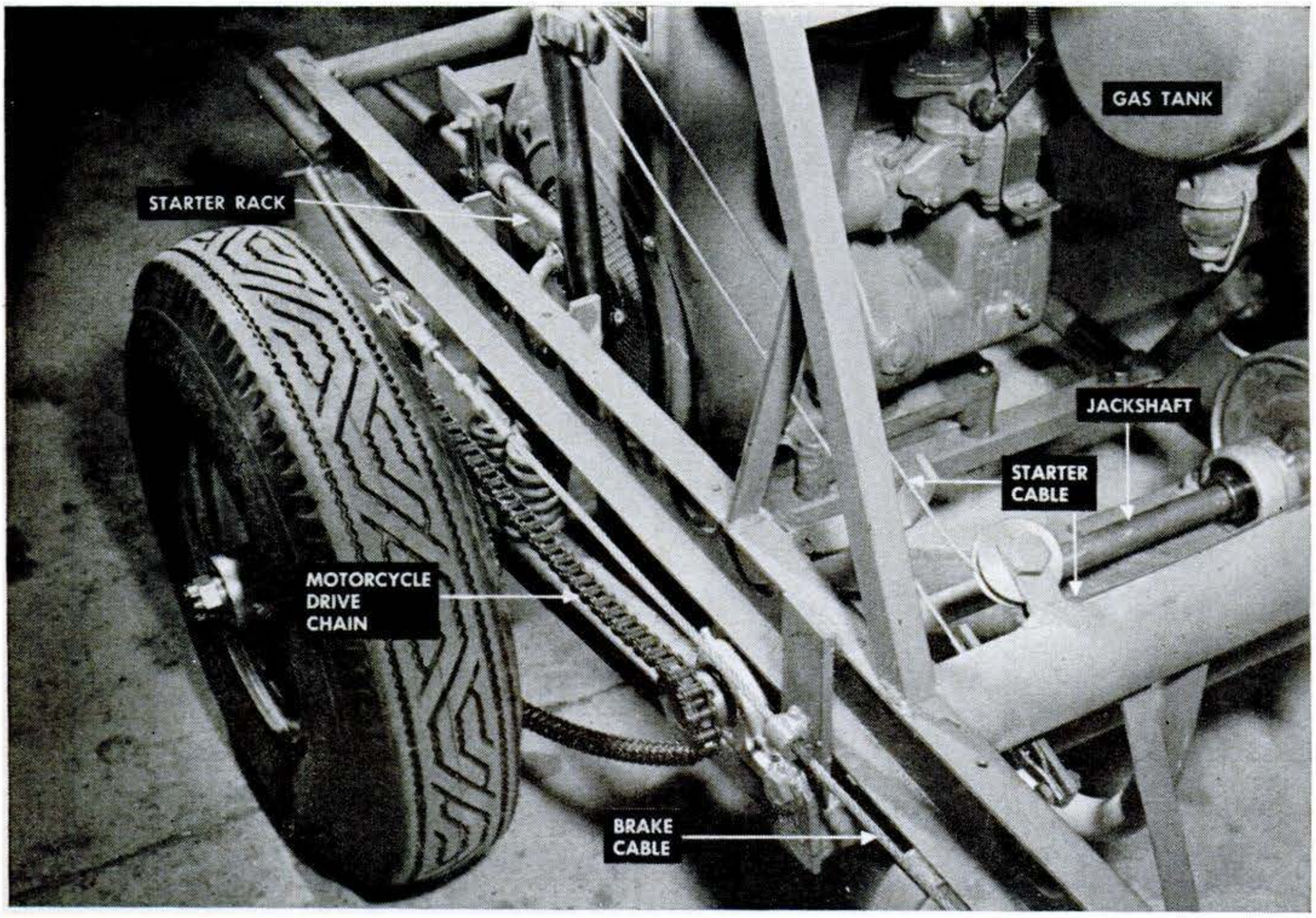
One-cylinder power plant slides on its mounts for tensioning drive belt (not shown). Pulleys seen are for the single-ratio drive. Lighting generator runs only when lights are wanted.

low-speed clutch gets the car off to a smooth start. Then, at about 14 miles an hour, the high-speed clutch locks in, the low-speed drive free-wheels through an overrunning device, and you're rolling in high.

On a hill, you stay in high until speed drops to about seven miles an hour. Then there's a quick automatic shift to low, during which the engine picks up speed. You go right up.

The centrifugal elements that take up the load are faced with molded lining and give a positive lock when they are engaged. Both V belts are the heavy industrial type, with steel cables inside.

The jackshaft drives a gearbox by which the car can be reversed. From there a motorcycle chain drives the right rear wheel. To back up the car, you flip over a short lever under the front of the seat. That's the only time you touch anything resembling a gearshift, and the only thing Aunt Matilda could stub a thumb on. The lever has a neutral position, so the car can be towed



Chain from jackshaft drives rear wheel. Starter meshes rack with engine pinion only when cable is pulled. Wheels run on tapered roller bearings. Tires are 5.50 by 8, 18 inches outside.

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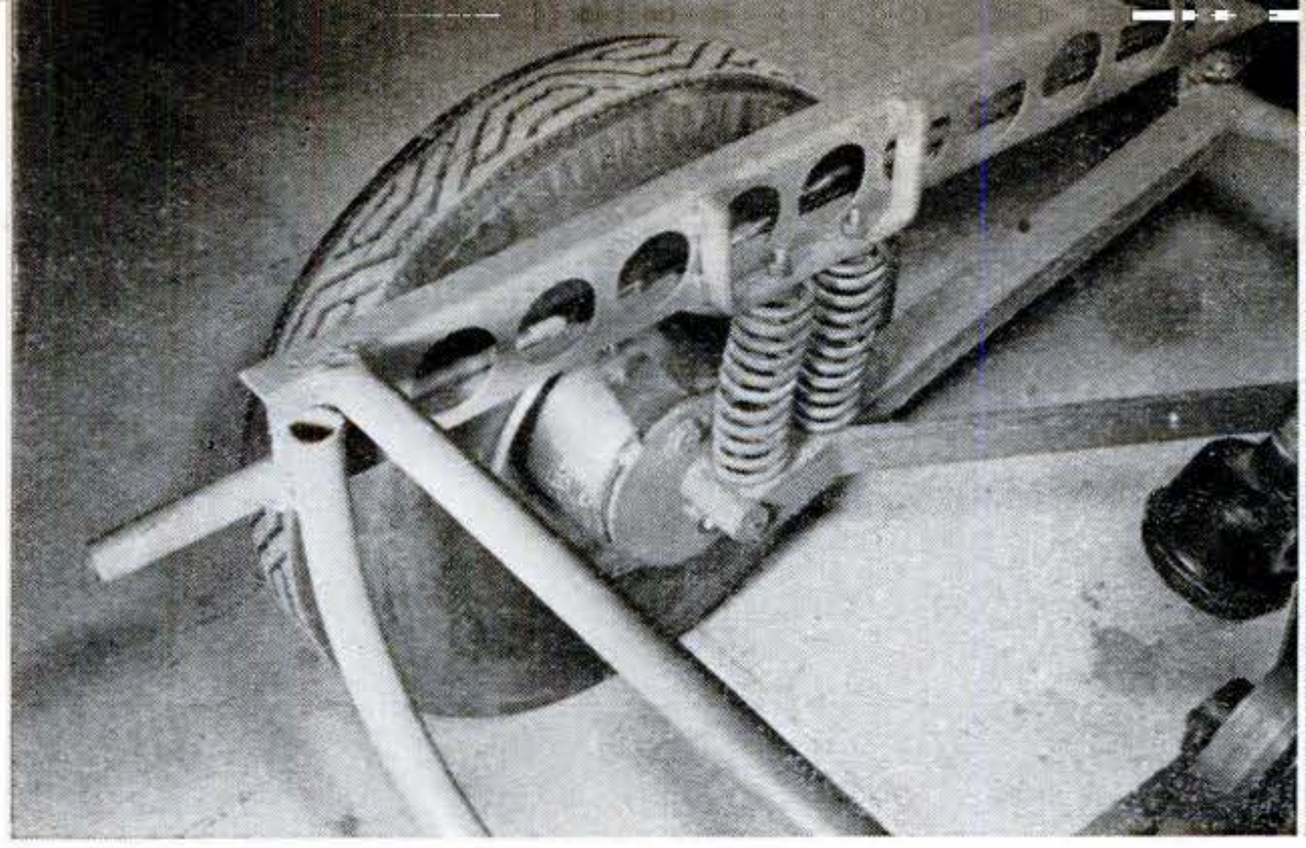

Wheels are sprung independently. Each rear one is mounted on a triangular frame pivoted at its wide end (upper right in photo). Front wheels have enclosed springs, oil shocks.

Four-wheel springing can take it, as I discovered by repeatedly running up curb at driveways and then hopping off (above). The bump was easy, and there was no loss of control.

easily, without turning the engine over.

How's the ride? Not sedan-soft, but by no means uncomfortable. All four wheels are independently sprung—the rear ones on coil springs, not snubbed, and the front ones on oil-filled combination shocks and springs, heavily snubbed. You can bounce the back of the car, but not the front. Despite the absence of rear shock absorbers, the drive wheel will always stay flat-footed on the ground.

Steering is through a gear and segment, with a much lower ratio than the one in your Breezeway Eight. The Midget responds like a sports car on the turns; a twitch and you're around the corner. But that snubbed front end makes it foot around the curves nicely; there's no sway or wandering. With its low center of gravity, it would be hard to turn over.

The chassis is of welded-steel tube and channel. Body parts are cold-rolled steel. Like a plane, the car has a plastic windshield—it costs less than safety glass, is light and nonshatterable, but can be scratched.

How about bad weather? Side curtains and heater are extras. The curtains are fitted on a steel frame, hinged like a door. The canvas top stretches over a strong steel-tubing frame, well supported by the windshield posts and by braces at the rear. But you can't take the top down on the road, for there is no way to stow the frame. "Next year, maybe we can make it fold," say the designers hopefully.

What about servicing? King Midget dealers are scarce, but the little car has fewer potential trouble spots than any other. The drive chain, subject to grit and wet, may need occasional adjustment or replacement. Drive-belt tension is a simple matter of tightening a draw bolt on the engine. Brake adjustments are easy and obvious.

Owners who know which end of a wrench fits the bolt will probably enjoy working on

[Continued on page 266]

Top speed won't get you a ticket on this highway. Officer Joe McBride of Athens police clocked a new King Midget for PS at 42 m.p.h. The car will beat that when broken in.

From dead stop, car started up 37-percent grade (tough even to *walk* on), though drive wheel spun on smooth brick. On ordinary "steep" 17-percent hill, wheel didn't slip.

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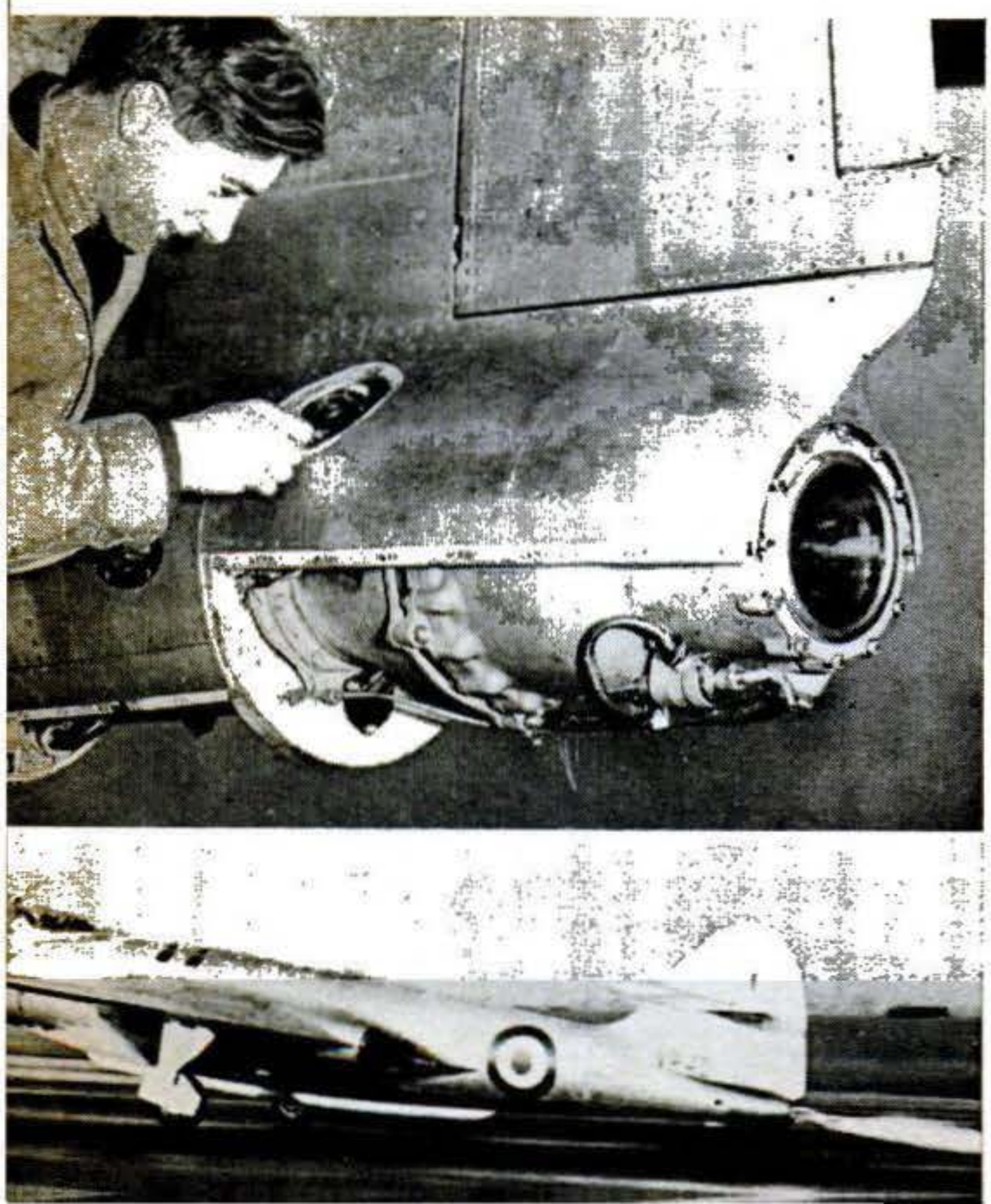
Four-Engine Bomber. Here is the first flight picture of the RAF's new long-range bomber, the Vickers Valiant. The swept-wing plane first appeared publicly in the recent annual British aircraft show at Farnborough. There spectators saw it zip across the sky at more than 600 m.p.h., claimed to be a record for its size. Other performance figures are still secret. Four Rolls-Royce Avon engines are housed completely within the sleek ship, each pair sharing an air intake in the wing. Dubbed unofficially an atom-bomb carrier, the Valiant has been ordered in quantity.

Britain Shows 'Fastest Jets'

Built-In Booster. The "Snarler," an auxiliary rocket engine unveiled at Farnborough, gets its name from its noise. Shown built into the tail of an experimental jet, the 215-lb. motor provides an extra 2,000 lb. of thrust for take-off (lower photo), climbing or a sudden burst of speed.

Top-Speed Fighter. The Hawker P-1067 (below) is described by the British Air Ministry as the "world's fastest" fighter—faster than Russia's MiG-15 or the U. S. F-86 Sabre. Observers who got a glimpse of it at the air show estimated its speed as at least 700 m.p.h. All details are secret.



How the Hand Grenade Works

The hand grenade is the infantryman's personal artillery, for use against machine-gun nests and other dug-in targets. The most common type is the fragmentation grenade. When it explodes, its notched body splits into dozens of deadly chunks of flying metal. Other types are non-fragmentation, smoke, tear-gas and incendiary grenades.

To throw one, you hold handle against grenade's body, pull pin and hurl it overhand. Powder train reaches detonator in about five seconds and then . . . *duck!*

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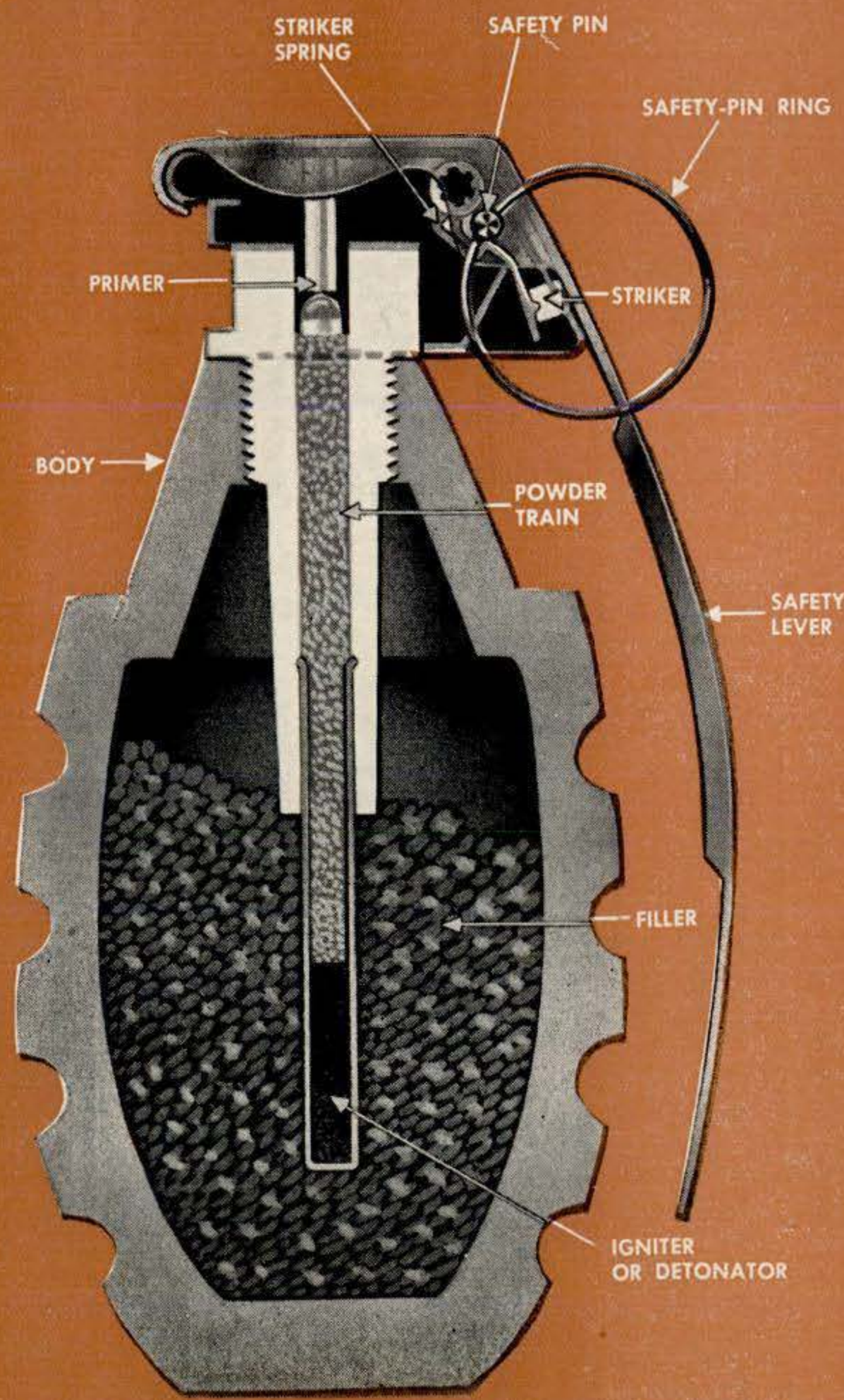
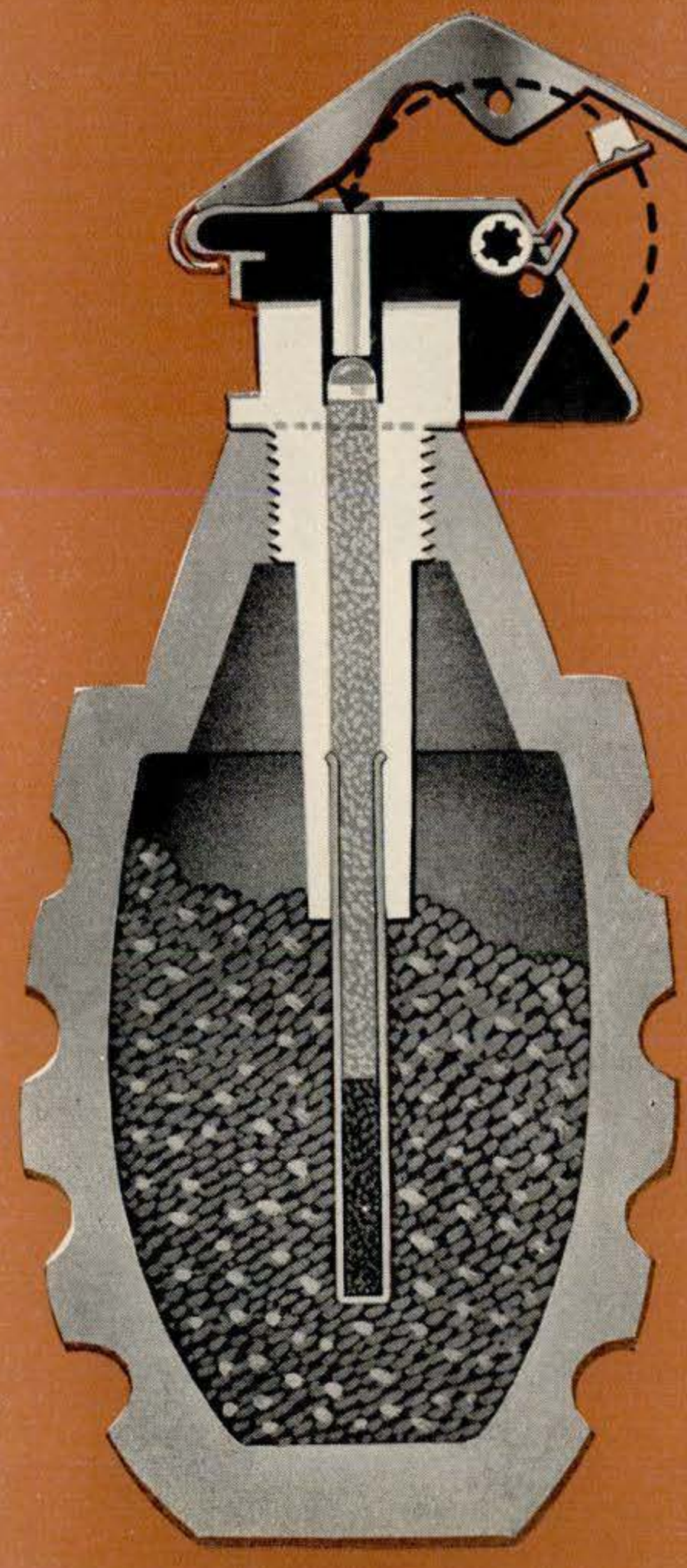
THESE ARE THE PARTS...



THIS IS WHAT HAPPENS AFTER SAFETY PIN IS PULLED...



1 With safety pin out of the fuse body, only hand pressure on safety lever keeps fuse from starting to work.

2 When safety lever is released, striker spring swings striker around to hit primer, causing it to burn.

3 Primer sets off time fuse that carries fire to detonator.

4 Detonator bursts, causing grenade to explode into death-dealing fragments.

Know Your Weapons

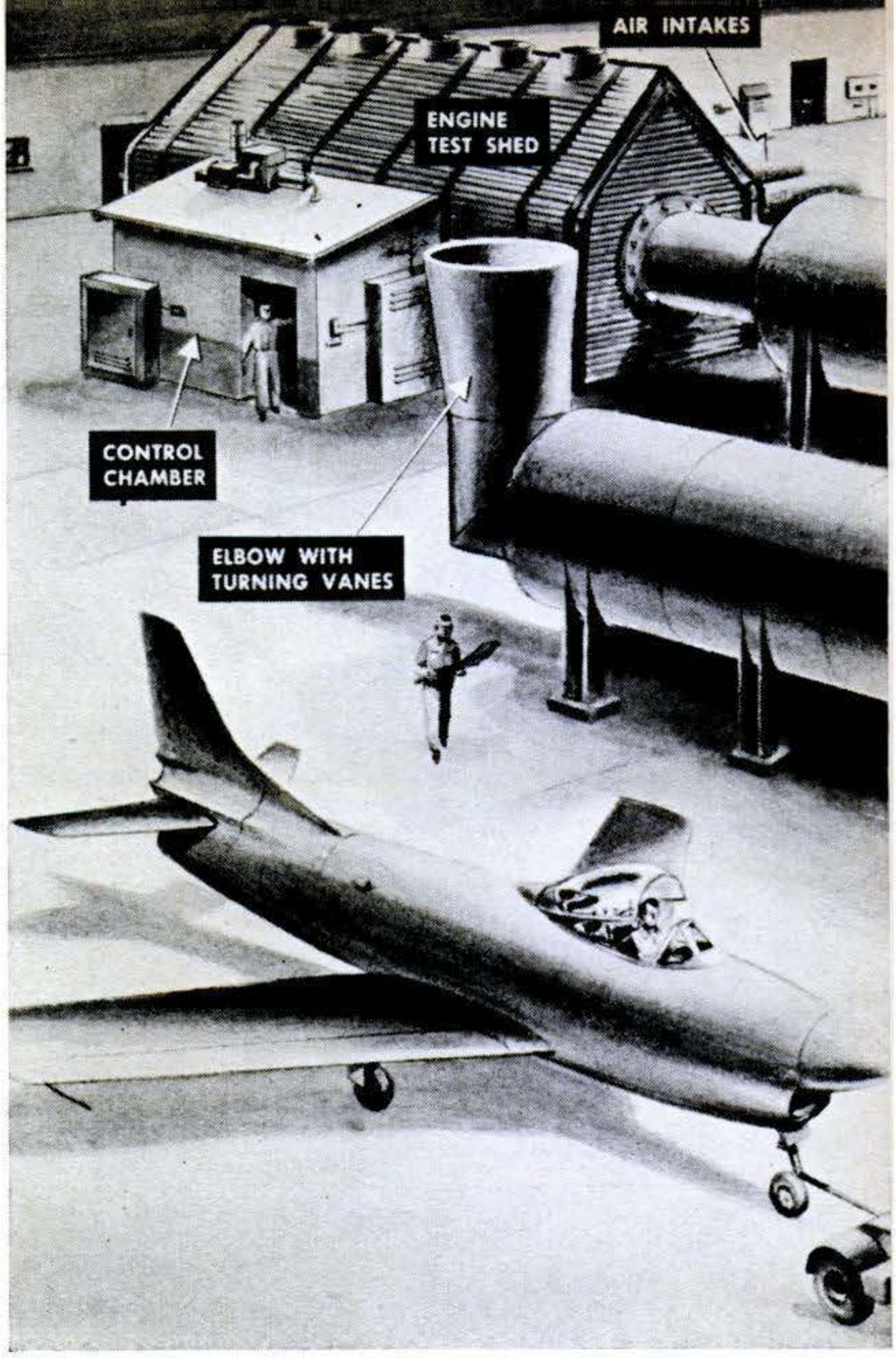
Huge Silencers Cut Roar of Jet Engines

WORKMEN no longer have to shout to be heard above the roar of jet engines at the North American Aviation manufacturing plant in Los Angeles. They have tied cans—silencers—to the engine exhausts.

The drawing at the right shows how it's done. Two silencers are pictured. The one in the foreground enfolds the tail of a fighter plane. Air is circulated through this Quonset hut to cool and equalize the pressures on the tail pipe. The silencer proper sticks out from the rear of the hut.

The other building, in the background, is for testing jet engines alone. The two silencers rest alongside each other on steel pedestals.

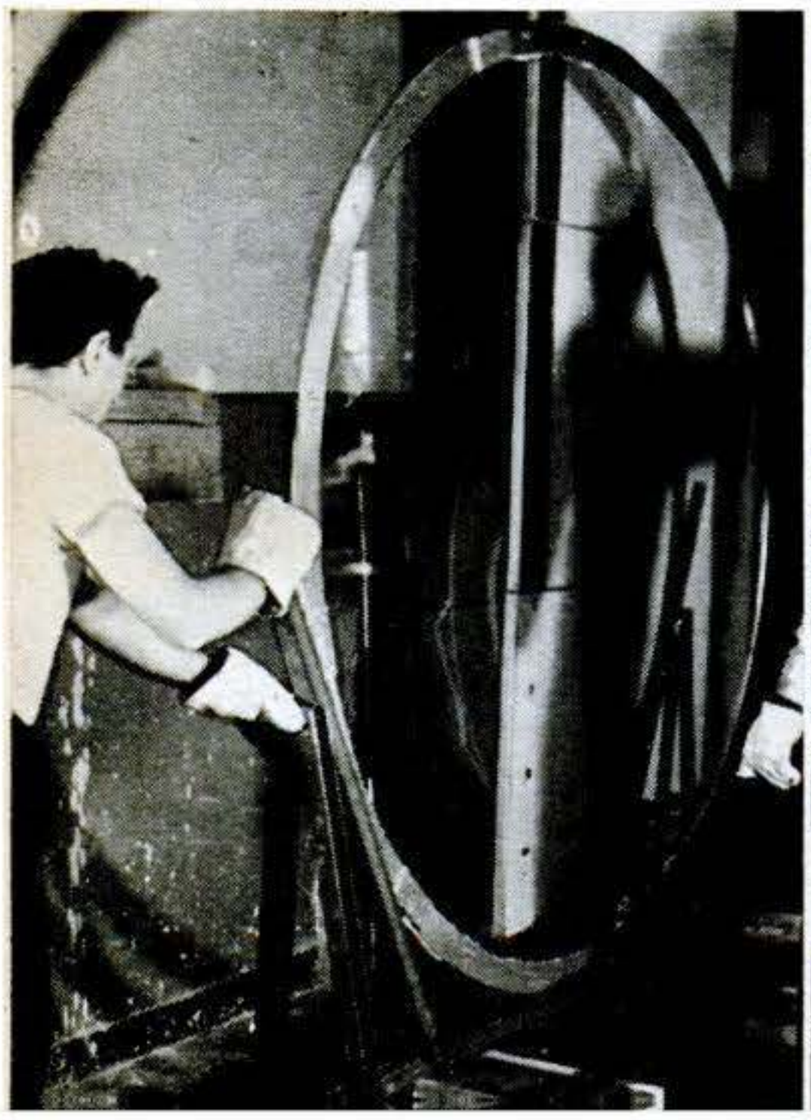
The muffling is done by routing the exhaust gases through a pipe built on the same principle as the Maxim silencer for guns. In addition, an elbow fitted with turning vanes expands the gases evenly as they reach the outside air and reduces their velocity to rob them of their whine.

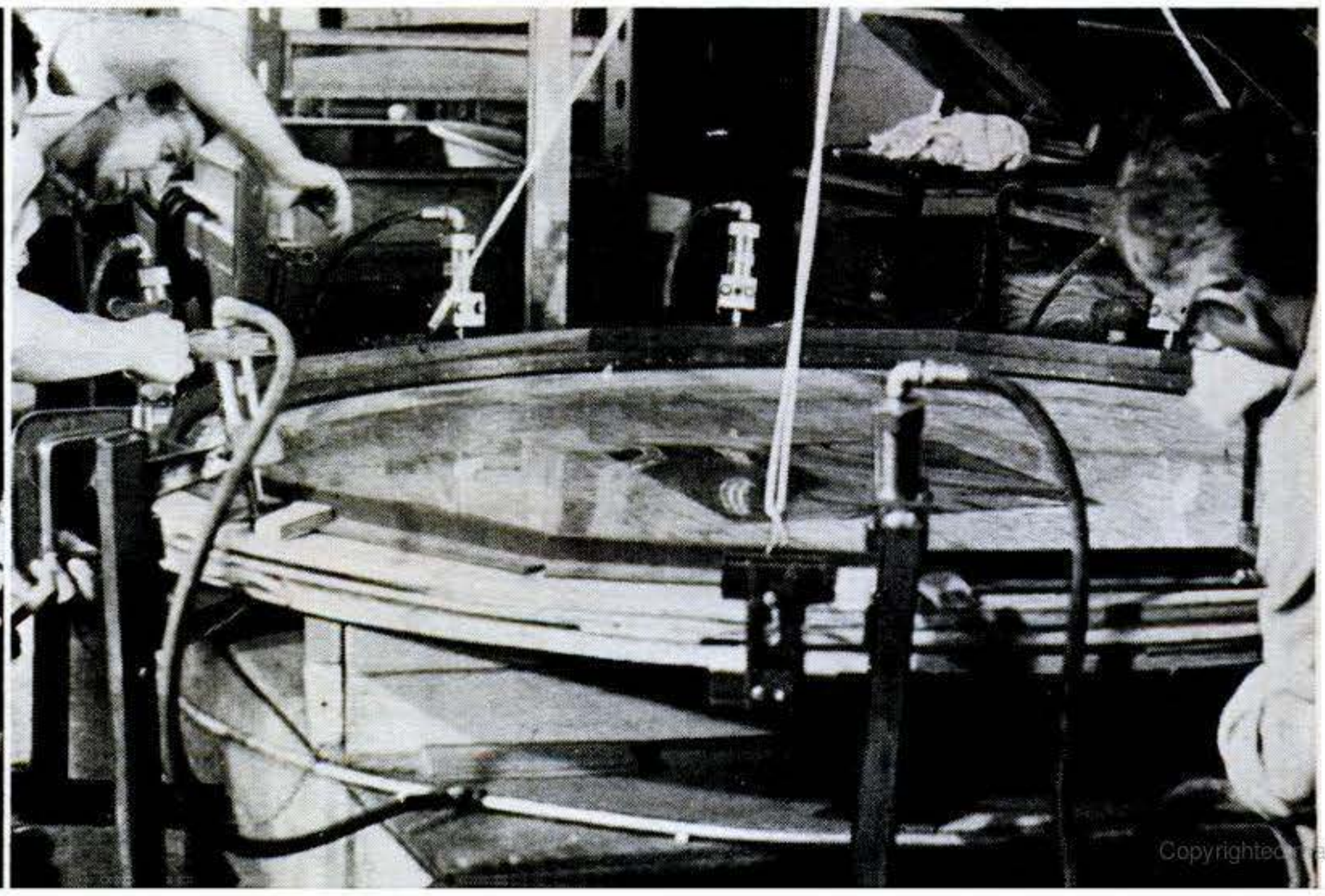


This Is How They Blow Bubbles

1 The fish-bowl canopy that encloses the pilot's cockpit of many helicopters starts out as a sheet of Plexiglas. The sheet first is cut into a disk, and then screwed to an aluminum ring, as shown below, that serves as a support during fabrication process illustrated here.

2 Heating in an oven to about 350 degrees is the next step. After the plastic disk has been softened to the flexibility of rubber, it is removed from the oven and placed in a forming jig, below. Here hydraulic clamps create an airtight seal between the rim and the jig.





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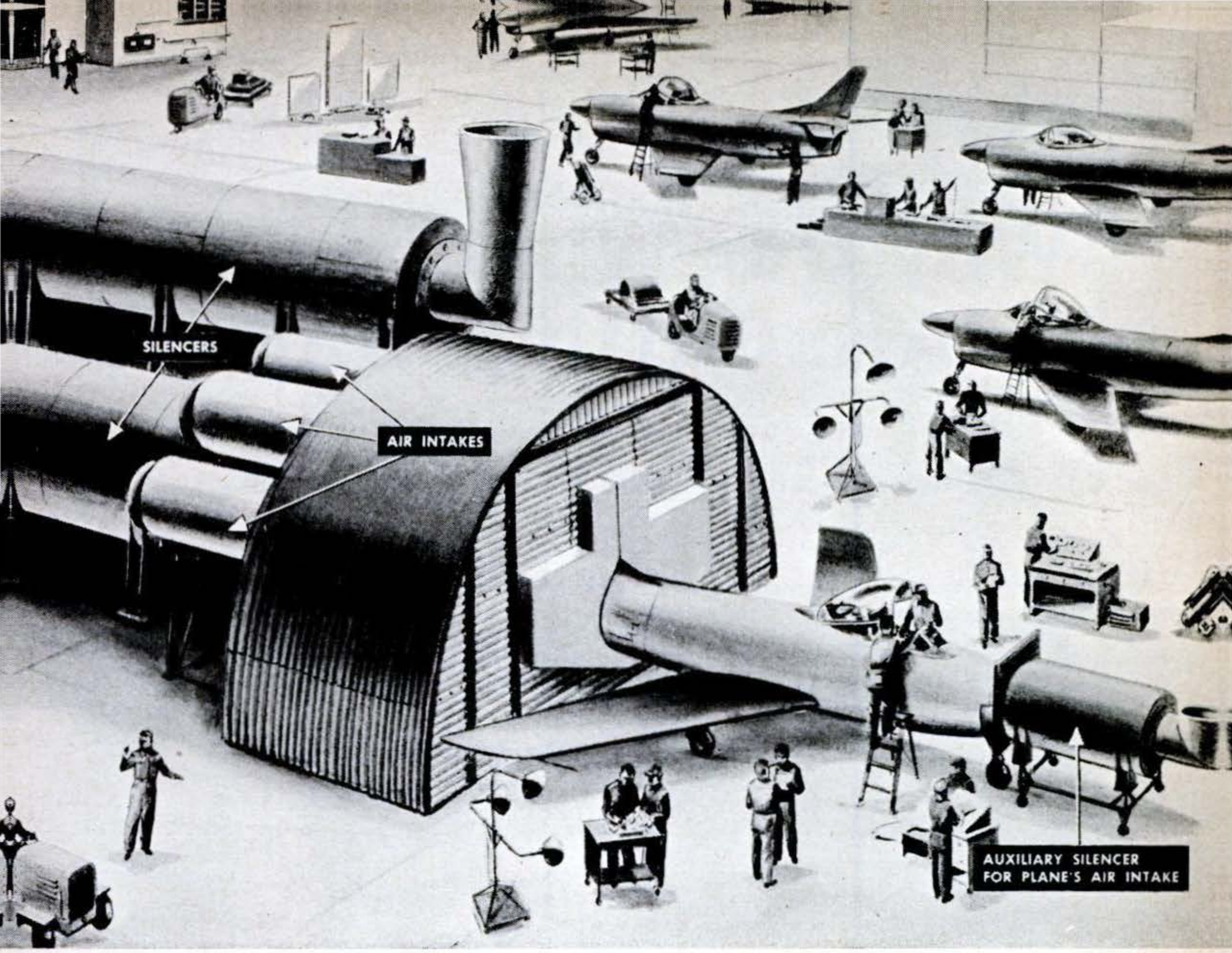
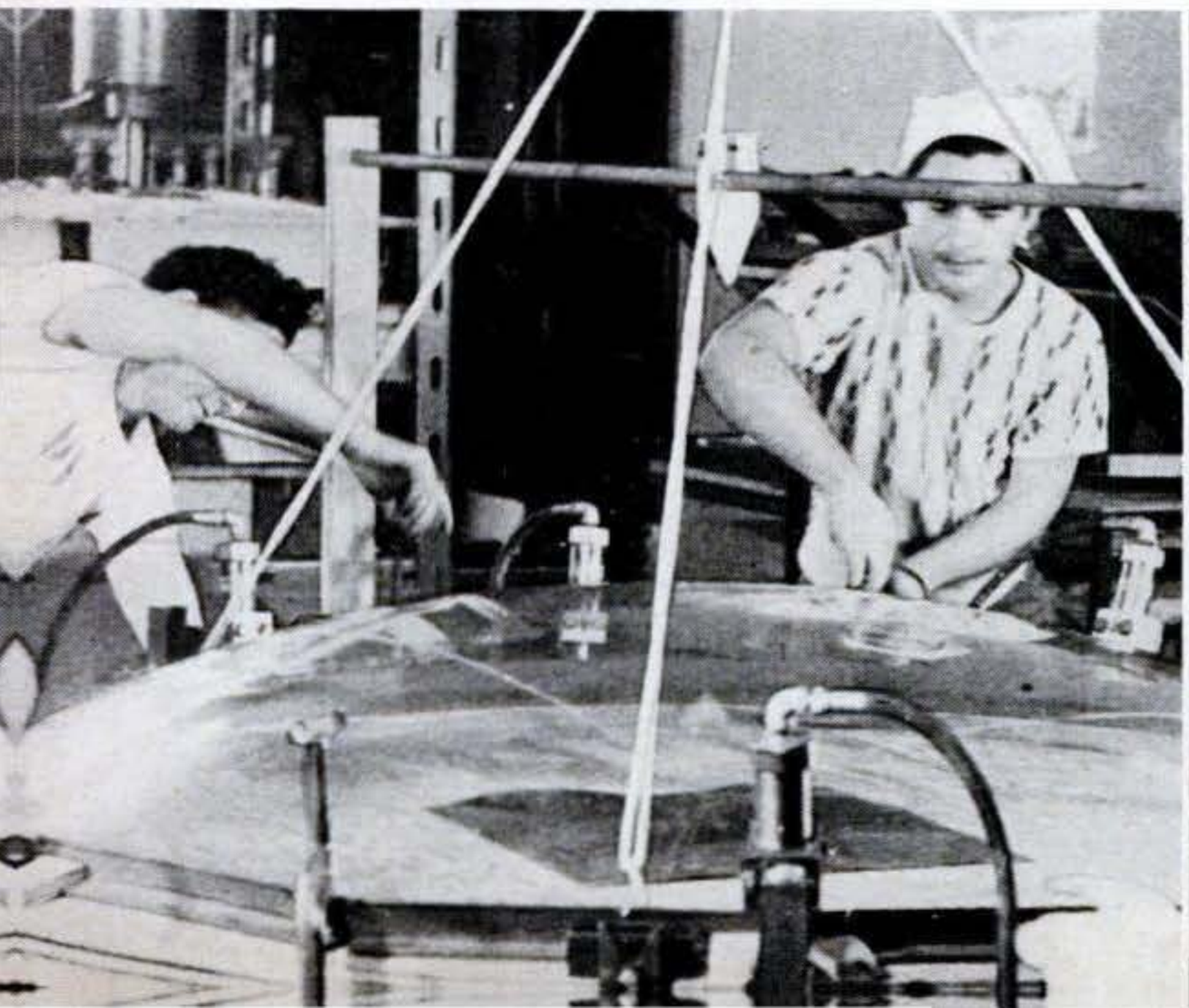
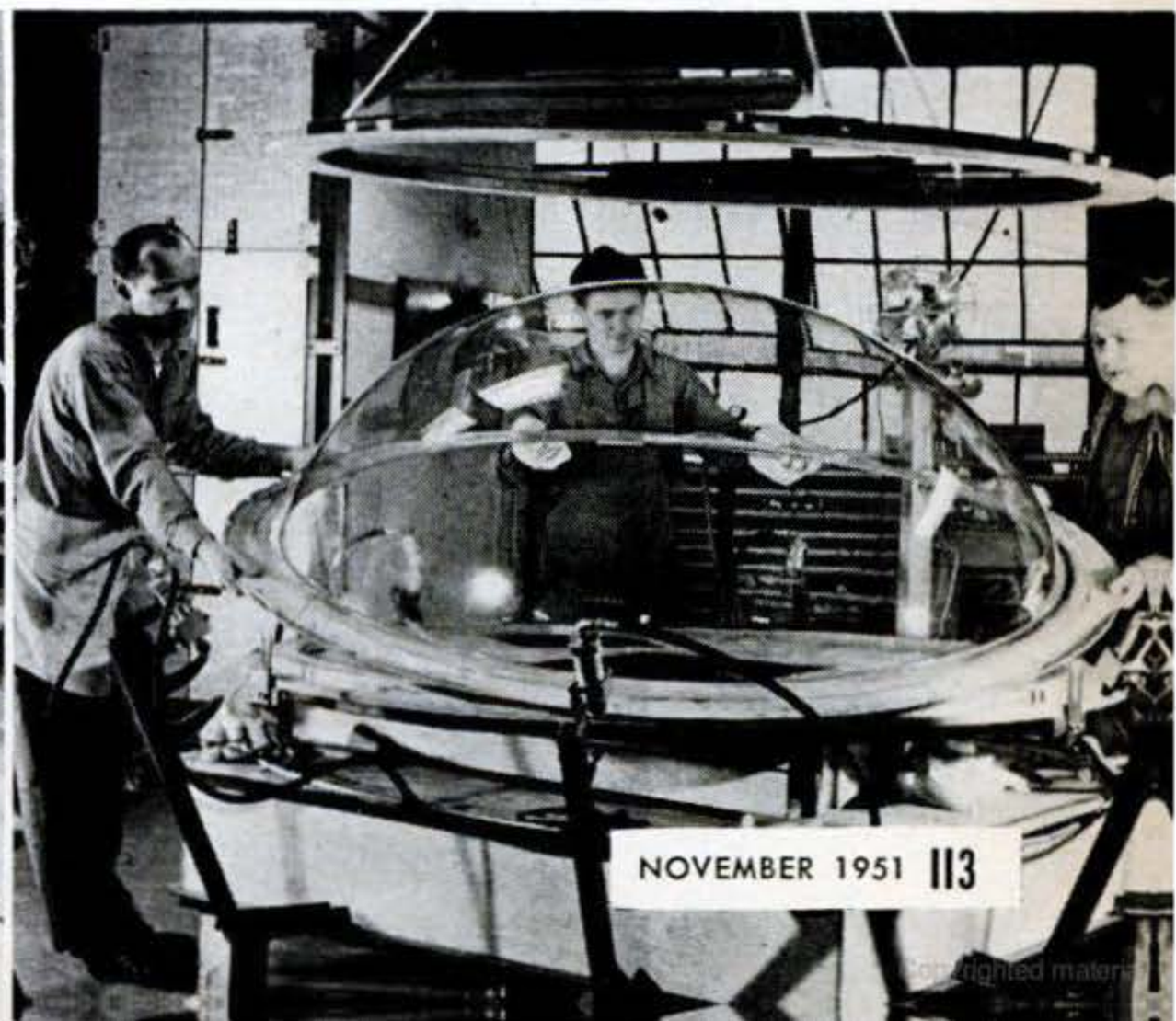


in Plastic to Make Aircraft Canopies

3 **Air pressure** is then applied from below. This is increased as the disk, still hot and pliable, starts to swell upward, forming a blister. Even after it has become a full half sphere, as shown at right below, pressure is maintained until the plastic has cooled.

4 **After the plastic bubble** has cooled and hardened, the workmen remove it from the jig in preparation for final machining operations before it is fitted to a helicopter cockpit. Photos in this sequence were taken at Acrylic Plastics, Inc., of New York City.





The ocean comes alive in one of this year's most fascinating books. This article is condensed from The Sea Around Us *by Rachel Carson. A lifelong student of nature, Miss Carson is editor-in-chief of the U. S. Fish and Wildlife Service.*

Why Our Winters Are Getting Warmer

The old-timers are right—winters aren't what they were. And the reason may be gigantic tides deep under the sea that apparently change the climate of the whole earth.

The Atlantic is slowly rising, and there's enough water frozen in land ice to raise it 100 feet.

By Rachel Carson

From the book, **The Sea Around Us.**
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DAY by day and season by season, the ocean dominates the world's climate. Can it also be an agent in bringing about the long-period swings of climatic change that we know have occurred throughout the long history of the earth—the alternating periods of heat and cold, of drought and flood? There is a fascinating theory that it can.

This theory links events in the deep, hidden places of the ocean with the cyclic changes of climate and their effects on human history. It was developed by the distinguished Swedish oceanographer, Otto Pettersson, whose almost century-long life closed in 1941.

To review the Pettersson theory is to review also a pageant of human history, of men and nations in the control of elemental forces whose nature they never understood and whose very existence they never recognized.

Pettersson's work was perhaps a natural outcome of the circumstances of his life. He was born—as he died 93 years later—on the shores of the Baltic, a sea of complex and wonderful hydrography. In his laboratory atop a sheer cliff overlooking the deep

If ALL that ice were to melt, which is unlikely, New York would be flooded as shown below.

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Surface waves are mild compared to great submarine waves found at mouth of Baltic where salt water meets fresh. Such tide waves are thought to explain long-range climate changes.

waters of the Gulmarfiord, instruments recorded strange phenomena in the depths of this gateway to the Baltic. As the ocean water presses in toward that inland sea it dips down and lets the fresh surface water roll out above it; and at that deep level where salt and fresh water come into contact there is a sharp layer of discontinuity, like the surface film between water and air.

Giant Waves Under the Sea

Each day Pettersson's instruments revealed a strong, pulsing movement of that deep layer—the pressing inward of great submarine waves, of moving mountains of water. The movement was strongest every twelfth hour of the day, and between the 12-hour intervals it subsided. Pettersson soon established a link between these submarine waves and the daily tides. "Moon waves," he called them, and as he measured their height and timed their pulsing beat through the months and years, their relation to the ever-changing cycles of the tides became crystal clear.

He had found that the submarine waves varied in height and power as the tide-producing power of the moon and sun varied. From astronomical calculations he learned that the tides must have been at their greatest strength during the closing centuries of the Middle Ages—those centuries when the Baltic herring fishery was flourishing. Then sun, moon and earth came into such a position at the time of the winter solstice that they exerted the greatest possible attracting force upon the sea. Only about every 18 centuries do the heavenly bodies assume this particular relation. But in that period of the Middle Ages, the great underwater waves pressed with unusual force into the narrow passages to the Baltic, and with the "water mountains" went the herring shoals. Later, when the tides became weaker, the herring remained outside the Baltic, in the North Sea.

Then Pettersson realized another fact of extreme significance—that those centuries of great tides had been a period of "startling and unusual occurrences" in the world of nature. Polar ice blocked much of the North Atlantic. The coasts of the North Sea and the Baltic were laid waste by violent storm floods. The winters were of "unexampled severity" and in consequence of the climatic rigors political and economic catastrophes occurred all over the populated regions of the earth. Could there be a connection between these events and those moving mountains of unseen water? Could the deep tides affect the lives of men as well as of herring?

Tides Affect Climate

Marshaling scientific, historic and literary evidence, he showed that there are alternating periods of mild and severe climates

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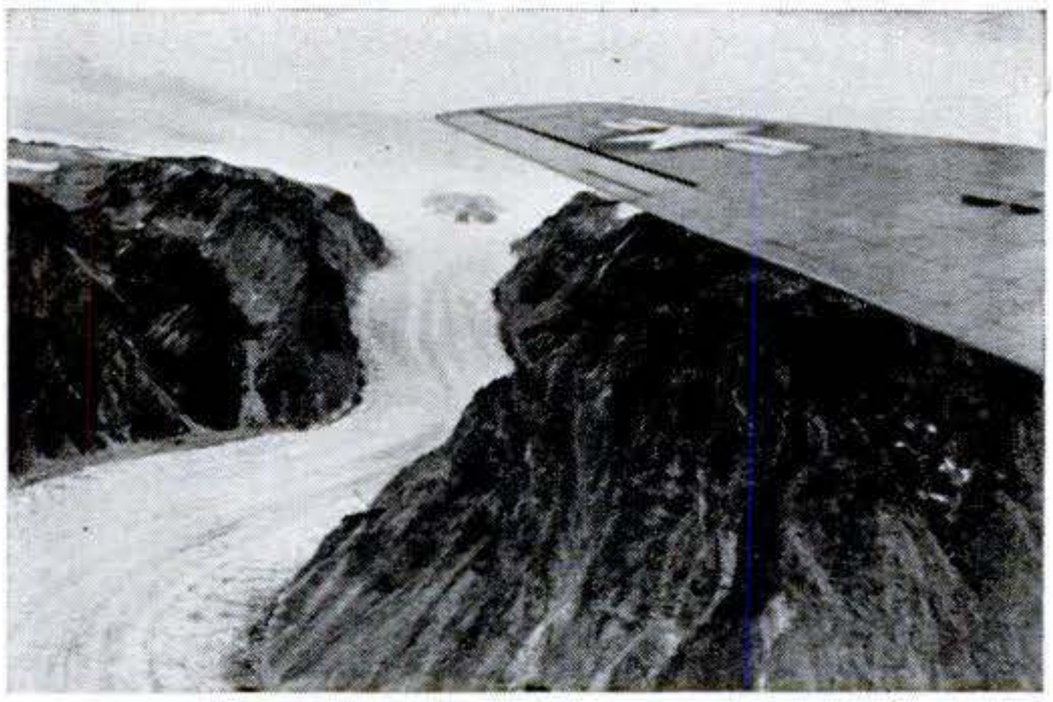
which correspond to the long-period cycles of the oceanic tides. The world's most recent period of maximum tides, and most rigorous climate, occurred about 1433, its effect being felt, however, for several centuries before and after that year. The minimum tidal effect prevailed about A.D. 550, and it will occur again about the year 2400.

During the latest period of benevolent climate, snow and ice were little known on the coast of Europe and in the seas about Iceland and Greenland. Then the Vikings sailed freely over northern seas, monks went back and forth between Ireland and "Thyle" or Iceland, and there was easy intercourse between Great Britain and the Scandinavian countries.

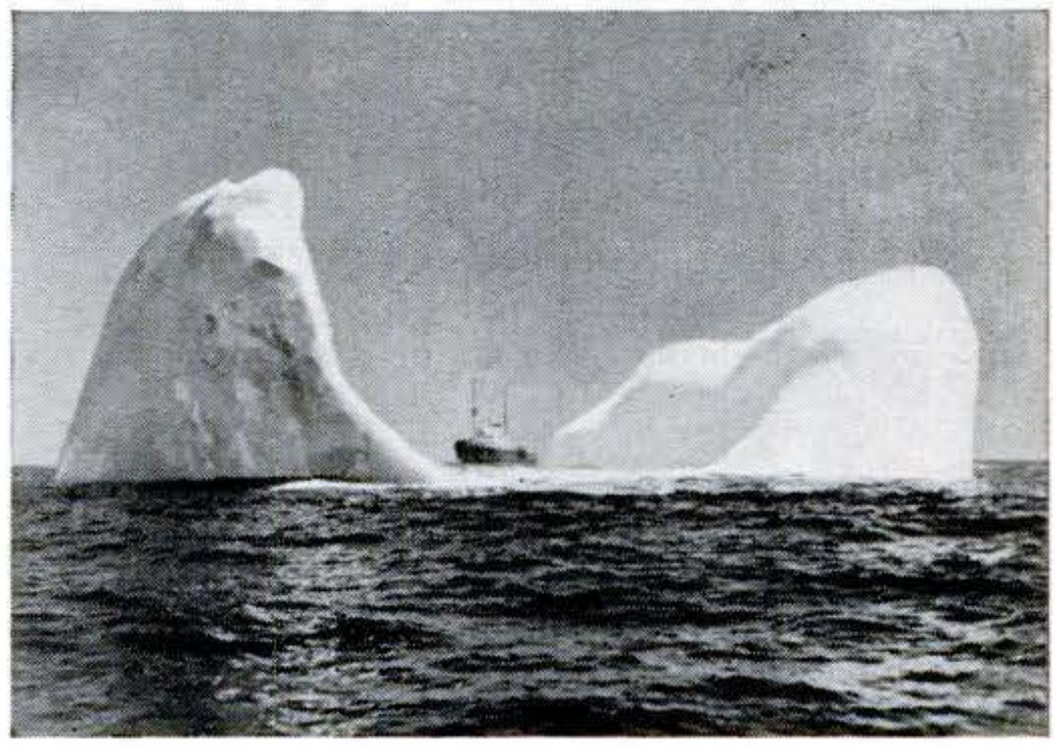
Storms and Floods Wreak Havoc

But these bland climatic conditions began to deteriorate in the thirteenth century. The seacoast of Holland was devastated by storm floods. Old Icelandic records say that, in the winters of the early 1300's, packs of wolves crossed on the ice from Norway to Denmark. The entire Baltic froze over, forming a bridge of solid ice between Sweden and the Danish islands. Pedestrians and carriages crossed the frozen sea and hostelries were put up on the ice to accommodate them. The freezing of the Baltic seems to have shifted the course of storms originating in the low-pressure belt south of Iceland. In southern Europe, as a result, there were unusual storms, crop failures, famine and distress. Icelandic literature abounds in tales of volcanic eruptions and other violent natural catastrophes that occurred during the fourteenth century.



Glaciers show effect of rising temperatures: they melt back faster than they are renewed by snow, so that they are shrinking. Many smaller ones have already disappeared.

All those ancient records of climatic variations seemed to Pettersson an indication that cyclic changes in the oceanic circulation of the Atlantic had occurred. Applying the discoveries in his laboratory on Gulmarfiord,



Less ice is drifting down from the frozen top of the world, opening far northern seas to fisheries and navigation—all signs of the warming up of subarctic regions.

he believed that the climatic changes were brought about as the tide-induced submarine waves disturbed the deep waters of polar seas. Although tidal movements are often weak at the surface of these seas, they set up strong pulsations at the submarine boundaries, where there is a layer of comparatively fresh, cold water lying upon a layer of salty, warmer water.

Warm Water Thaws Ice

In the years or the centuries of strong tidal forces, unusual quantities of warm Atlantic water press into the Arctic Sea at deep levels, moving in under the ice. Then thousands of square miles of ice that normally remain solidly frozen undergo partial thawing and break up. Drift ice, in extraordinary volume, enters the Labrador Current and is carried southward into the Atlantic. This changes the pattern of surface circulation, which is so intimately related to the winds, the rainfall and the air temperatures. For the drift ice then attacks the Gulf Stream south of Newfoundland and sends it on a more easterly course, deflecting the streams of warm surface water that usually bring a softening effect to the climate of Greenland, Iceland, Spitsbergen and northern Europe.

Although the really catastrophic disturbances of the polar region come only every 18 centuries, according to Pettersson, there

[Continued on page 252]

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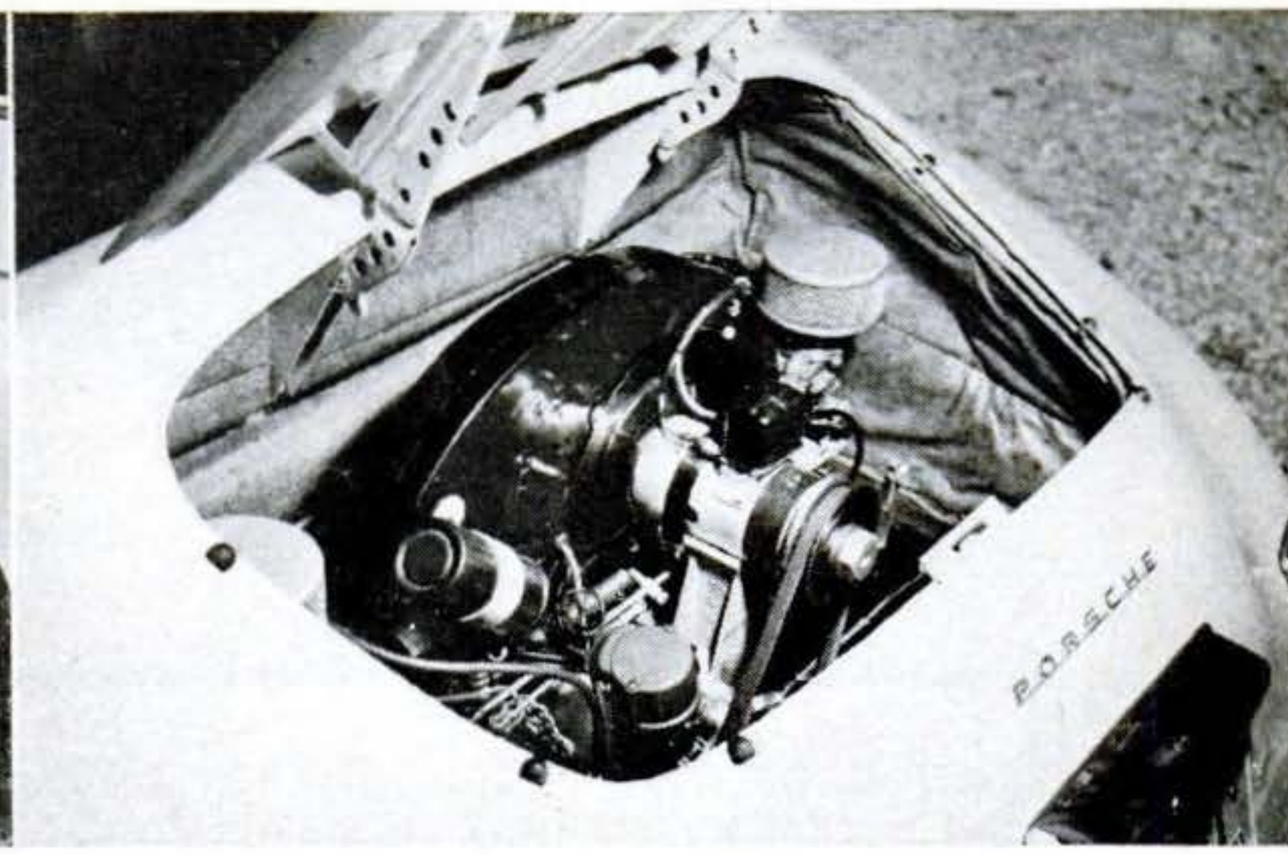
Porsche coupe at right has large luggage compartment behind front seats. This space can be converted into seats for two children or one adult. Convertible (below) has manually operated top. Seats are independently adjustable.

Germans Build Luxury Car

WHEN Dr. Ferdinand Porsche produced the prewar German Volkswagen (People's Car) he stressed utility and economy rather than the luxury of such cars as the Mercedes SSK which he also helped design. In his last effort (Dr. Porsche died early this year), however, he went back to his old love—and gave the result his own name. The Porsche car, now in production in West Germany, is a high-performance automobile that sells in the U. S. for close to $4,000. It is available in two body styles—coupe and convertible—and in three engine types—40 hp., 44 hp. and 52 hp., developing top speeds of 85, 90 and 100 m.p.h.

It is small and light. Over-all length is 12 feet, 8 inches; height is 4 feet, 3 inches; width is 5 feet, 6 inches; and weight is 1,640 pounds.

Spare wheel and fuel tank are located under front hood. With the car's low fuel consumption—it gets 35 miles per gallon—the 12-gallon tank gives a driving range of 420 miles.



Four-cylinder opposed (pancake) engine fits neatly into rear compartment. Each engine is individually assembled by one mechanic. There are two downdraft carburetors.

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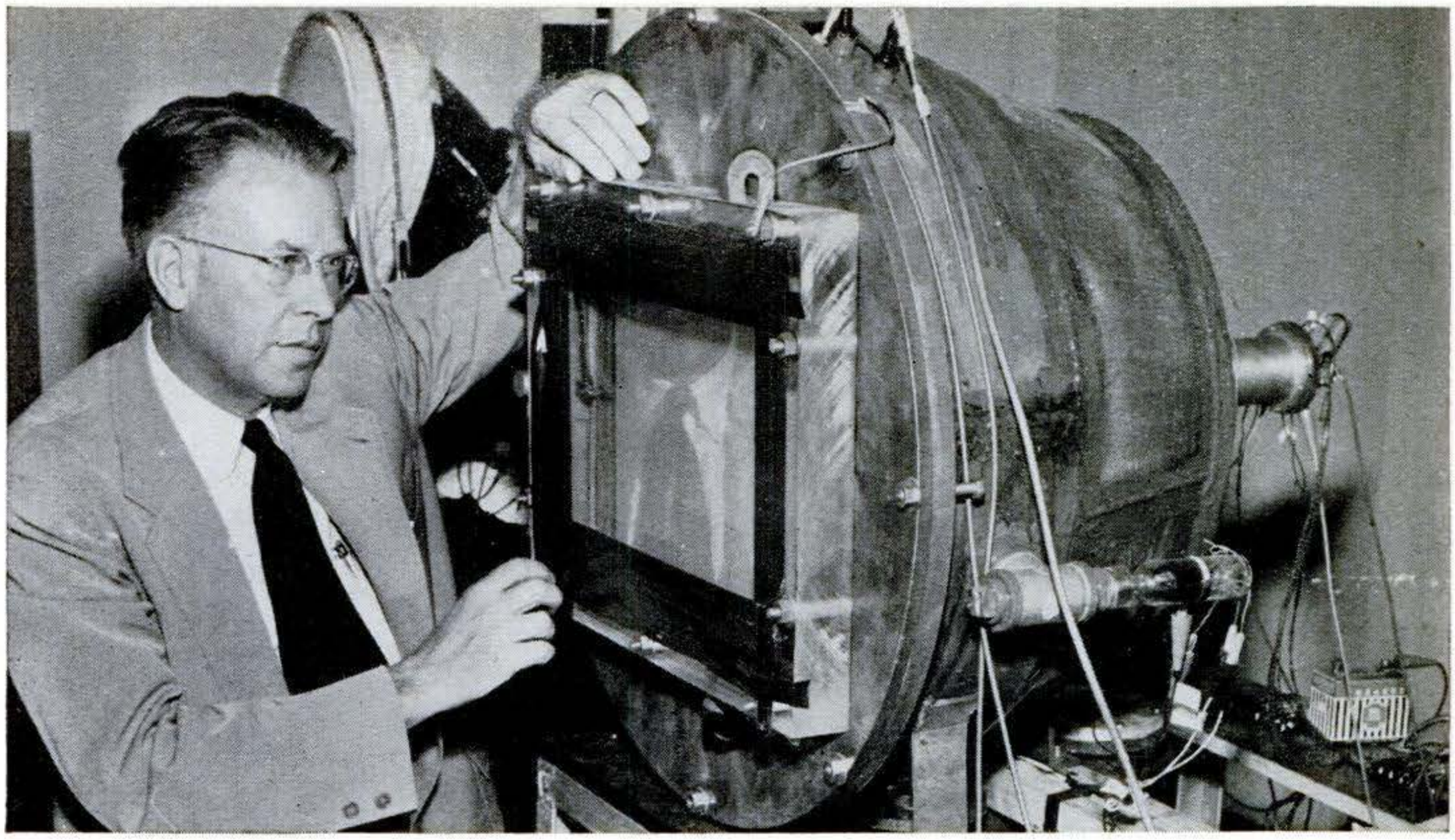
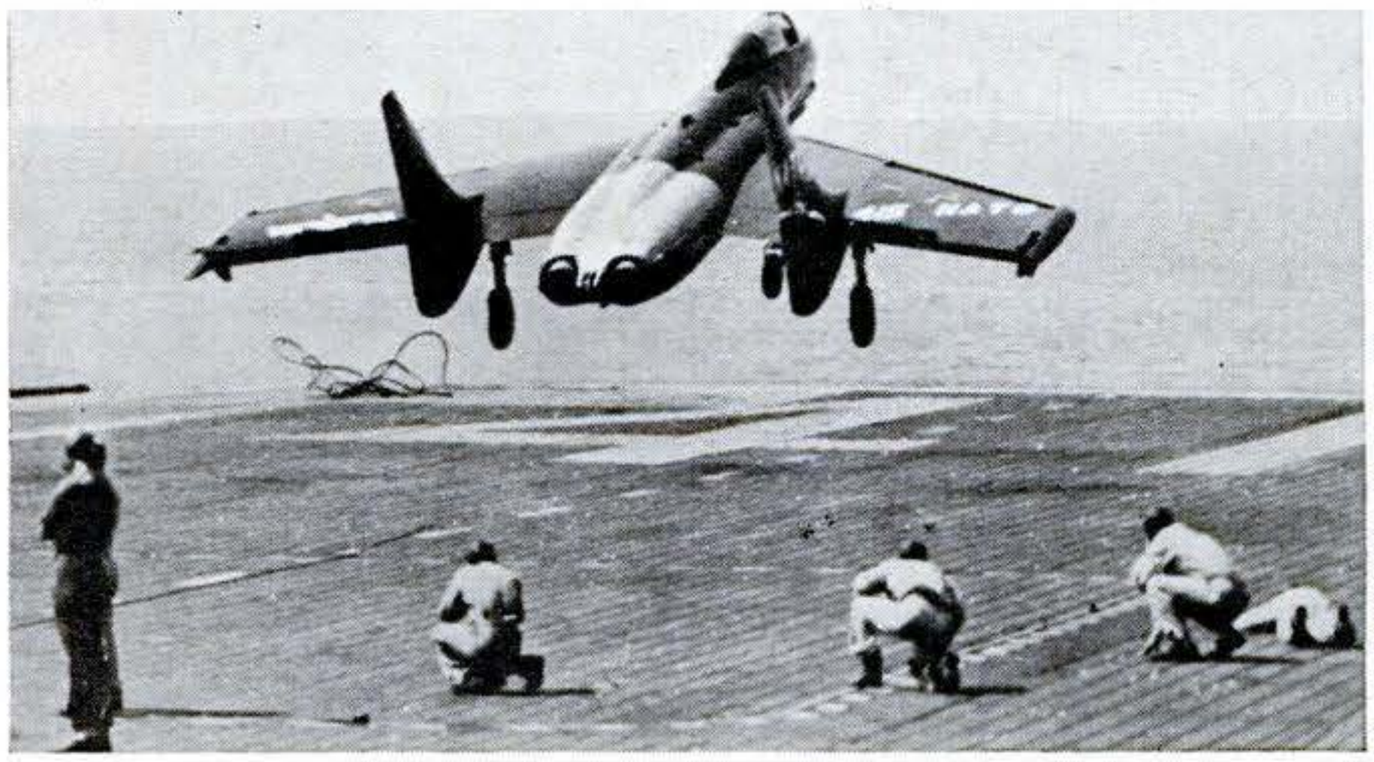


Scientist Makes Color TV Tube

PROF. ERNEST O. LAWRENCE, University of California scientist who invented the atom-smashing cyclotron, exhibits above a color-TV tube he has devised for receivers. Paramount Pictures Corp., which plans to make it, says it eliminates whirling disks, works with any known color-TV system and costs little more than a black-and-white tube.

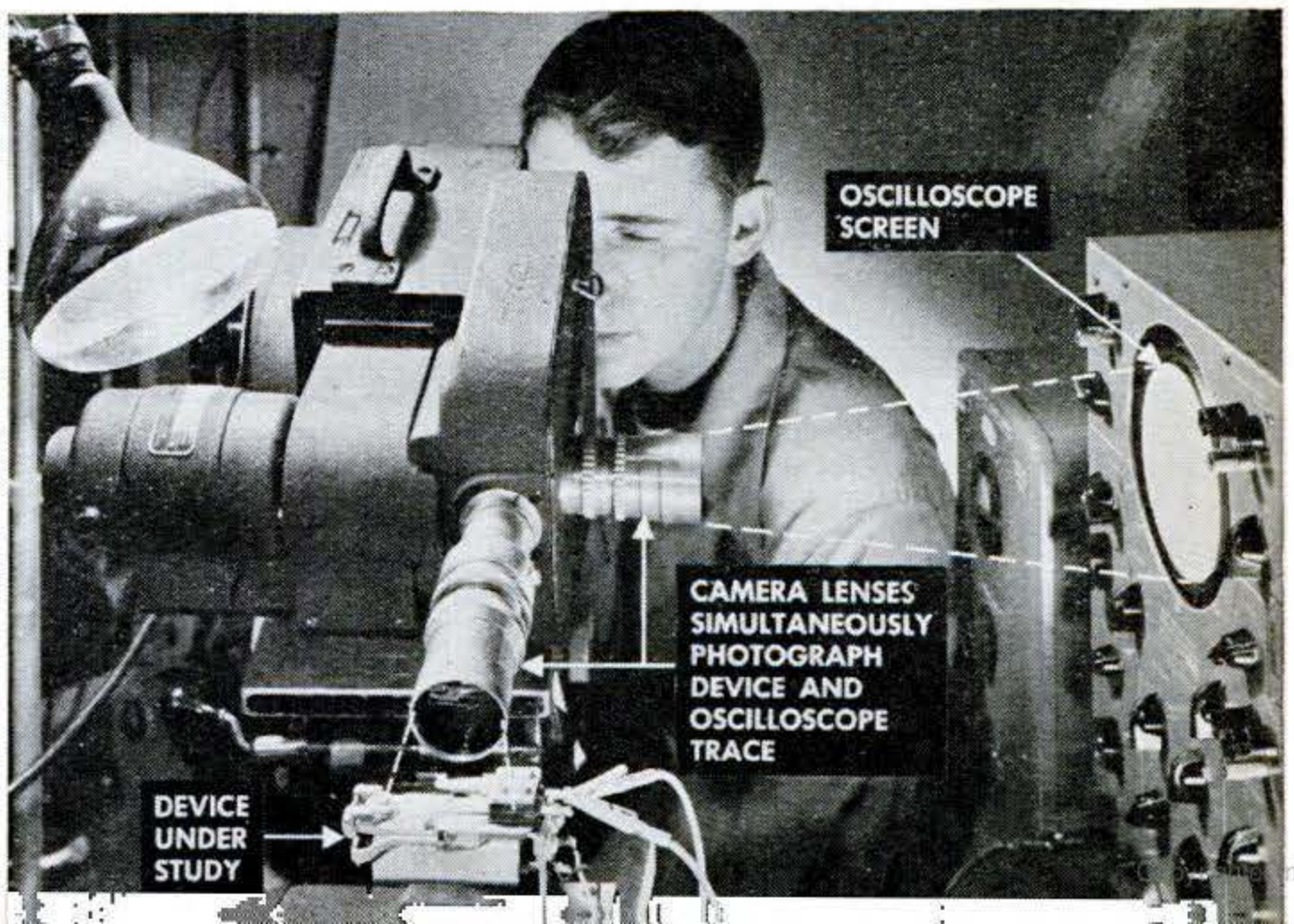


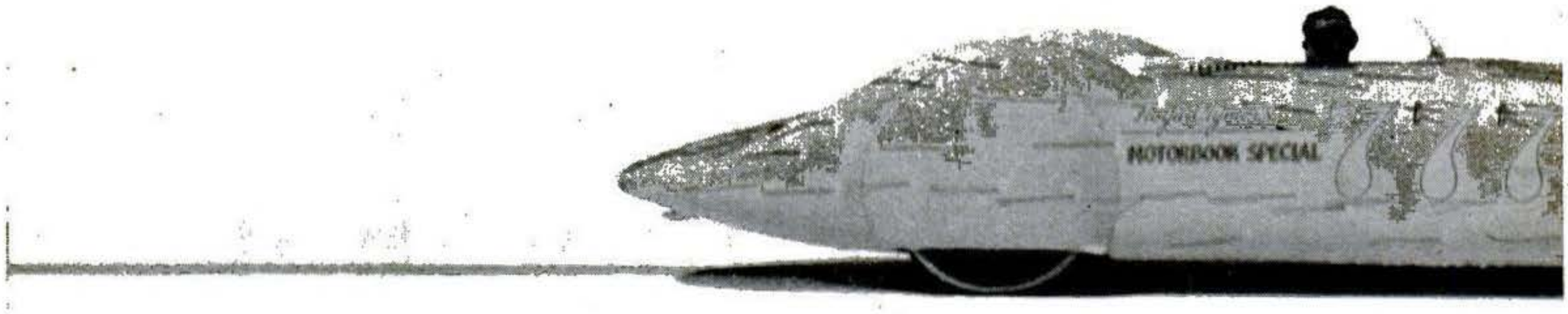
Navy Tests Tailless Jet

ONE of the Navy's newest jet fighters, the F7U Cutlass, is seen at left being catapulted aloft from the carrier *Midway*, in an initial trial at sea. Two axial-flow gas turbines propel the swept-wing tailless craft, which carries vertical fins at about the midpoint of each wing's trailing edge. Leading edges have full-span slots. The plane has a 39-foot wing span, 40-foot length, and a gross weight of 20,000 pounds.

Two-Eyed Camera Gets All the Data

A DEVICE'S mechanical and electrical action may be studied simultaneously with a new two-lens model of the Kodak High Speed Camera. On the same film, one lens pictures the device itself; the other, the luminous trace of an oscilloscope electrically connected to it.





Champion Hot Rod

By Andrew R. Boone

POWDER blue, streamlined No. 777 whirred smoothly down the straightaway, its twin V-8s singing in harmony.

"Two two seven point four eight one for the quarter," blared the loudspeakers. And moments later: "Two three oh point seven six nine two for the mile."

A hot rod had just skimmed a quarter-mile at 227, and *continuing to accelerate,* finished the measured mile faster than 230 miles an hour. On Utah's Bonneville salt flats, where Ab Jenkins and other speed greats set earlier records, a homemade car had whipped up nearly four miles a minute. Later in a two-way measured run it set an official hot-rod record of 221.4795 m.p.h.

To look at it, you'd think No. 777 was a costly custom job. But it's strictly hot rod

THESE ALSO RAN

Tiniest entry was 550-lb. Crosley with body from 165-gal. belly tank. Owner-driver Bob Alberts of San Jose, Calif., must remove shoes before easing into cramped cockpit. Four-cylinder engine puts out 50 hp. at 7,500 r.p.m. to get 98 m.p.h. Car won special O Class cup.

Chrome covers nearly all the metal, including the '24 Model T Ford frame, in Woody Lee's 1,600-lb. hot rod, which appeared at Bonneville for first time this year. Car, which hails from Oakland, Calif., has hit 131 m.p.h. Note overhead roll bar—sometimes a life saver.

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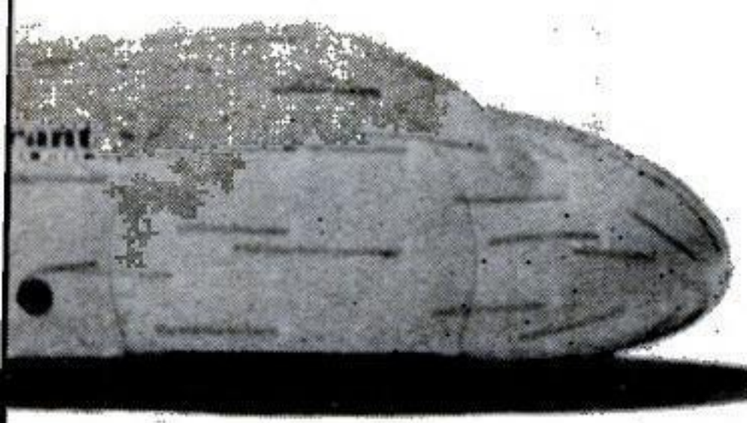
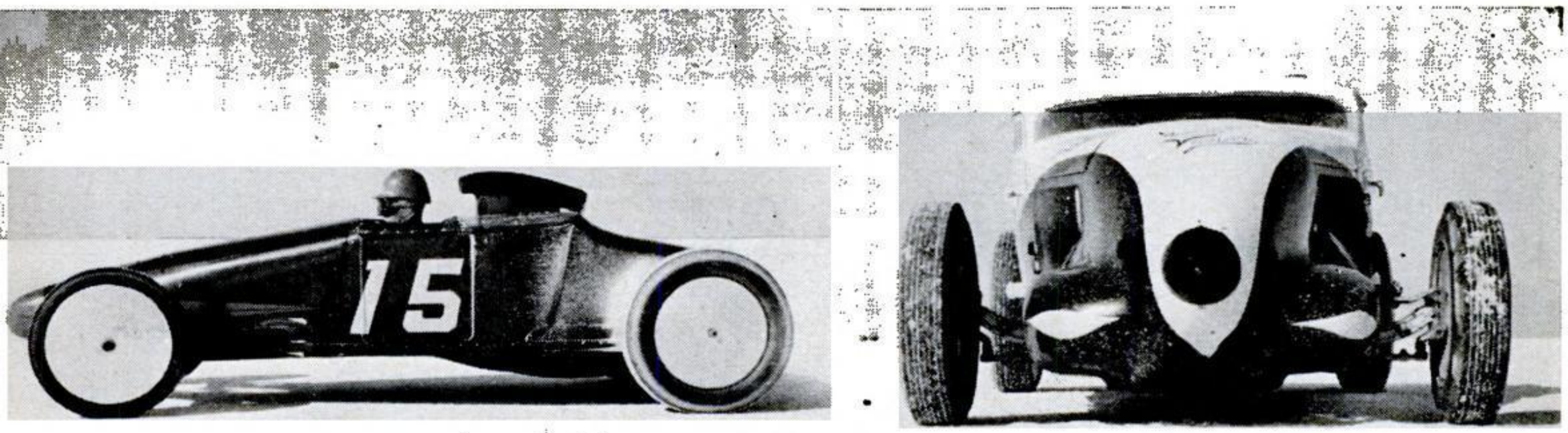
Hottest hot rod streaks across Utah's bleak Bonneville salt flats in a trial run. Strands of yarn taped to its sleek skin show smooth flow of air over speedster's streamlined body.



Hits 230 M.P.H.

by accepted standards: production engine and stock body, modified if desired. Originally the car had a Model A pickup body. Then, its designer-builders, Bill Kenz and Roy Wesley, started making changes on it in their Denver automotive shops. More than once their sleek job has been clocked at 175—running on the rear engine alone. To check the streamlining before the final run, Kenz and Wesley studied movies, made from a Cadillac convertible speeding alongside, that showed how black yarn taped to the body waved in the slipstream.

For its record run, No. 777 showed its exhausts to 200 other hot rods from 10 states in the third annual Bonneville National Speed Trials, sponsored by the Southern California Timing Association. Several of these cars will be shown at the Los Angeles Motorama this month. END



Jet assist from six exhaust stacks helps Akton Miller's 1,560-lb. job clip off 168 m.p.h. in C Class, 167 in B, using different Mercury engines. Air turbulence helps scavenge engine, reduces back pressure. Whittier, Calif., car has chopped '27 Model T body on home-built tubular frame.

Novi-style front on this 130-m.p.h. C-Class speedster was made from six Chevvie fenders welded together with a reversed headlight to form the nose cone. Originally it was a '34 Ford coupe, but channeling and top-chopping by Gordon Vann have lowered car 16 inches.

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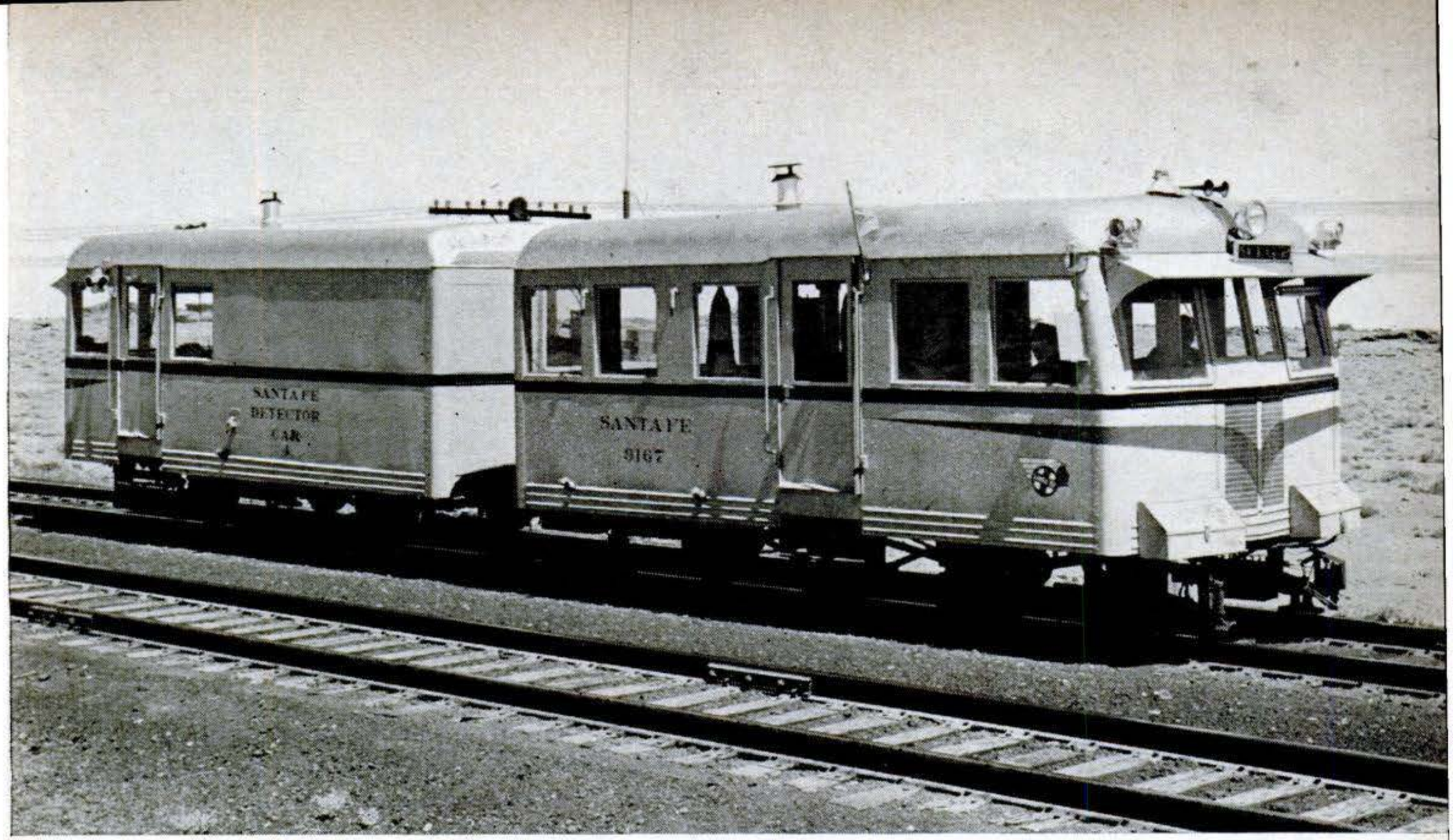
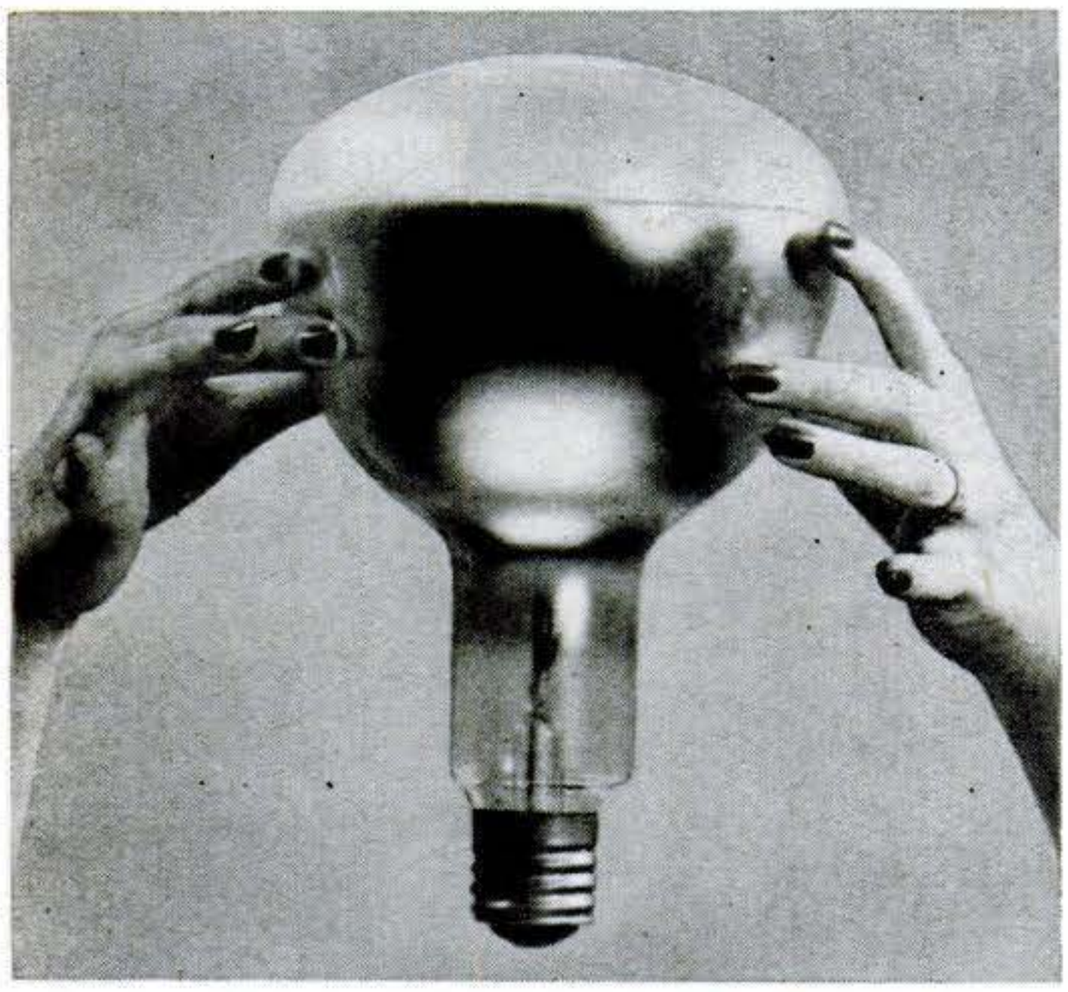


Detective Trains Spot Faulty Rails

ELECTRONIC trackwalkers, using the latest type of magnetic detecting gear, are snooping out faulty rails along 142,000 miles of track in the West and Southwest.

Moving at only six miles an hour, the special two-car Santa Fe detector trains pass powerful electromagnets along the rails. The magnets set up a magnetic field



Light Bulb Has Own Reflector

A NEW electric light for use in big industrial plants has a built-in reflector similar to that in the familiar Sealed-Beam automobile headlight. Put in the bulb itself, it eliminates the need for an outside reflector. The manufacturer, Westinghouse Electric, says the 800-watt light will burn for about four months on a two-shift factory operation, or half again as long as the 750-watt light now in general use.

Jet Fighters Get Tank Fins

Now they're putting wings on wing tanks. When bigger wingtip fuel tanks were added to the Air Force Lockheed F-94 jets that guard the air approaches to Japan, stubby horizontal stabilizers were attached to them. The additional surface, in effect lengthening the wing a few inches, was necessary to maintain the side-to-side stability of the plane with the added outboard weight. The planes are flown by the 314th Air Division.

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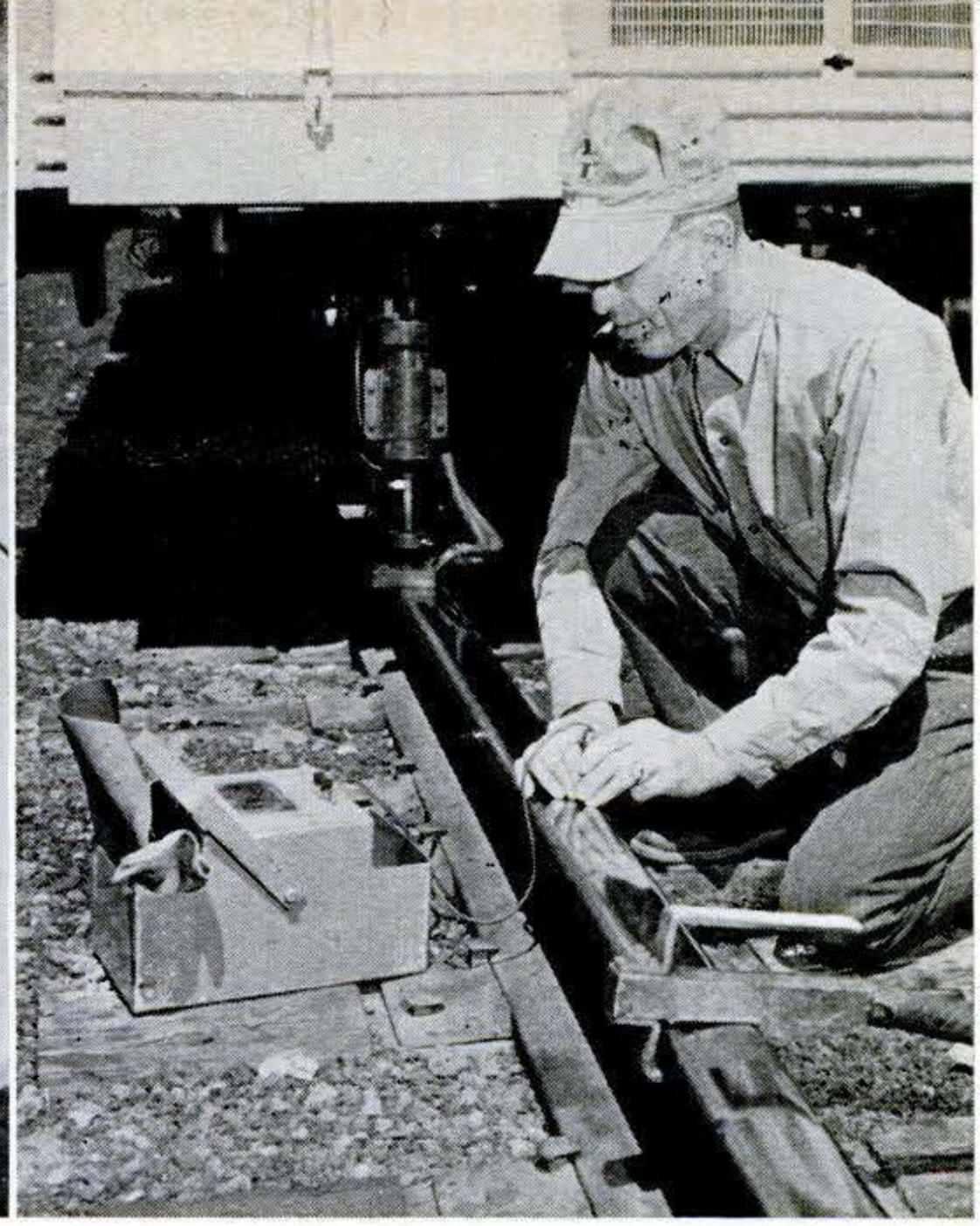
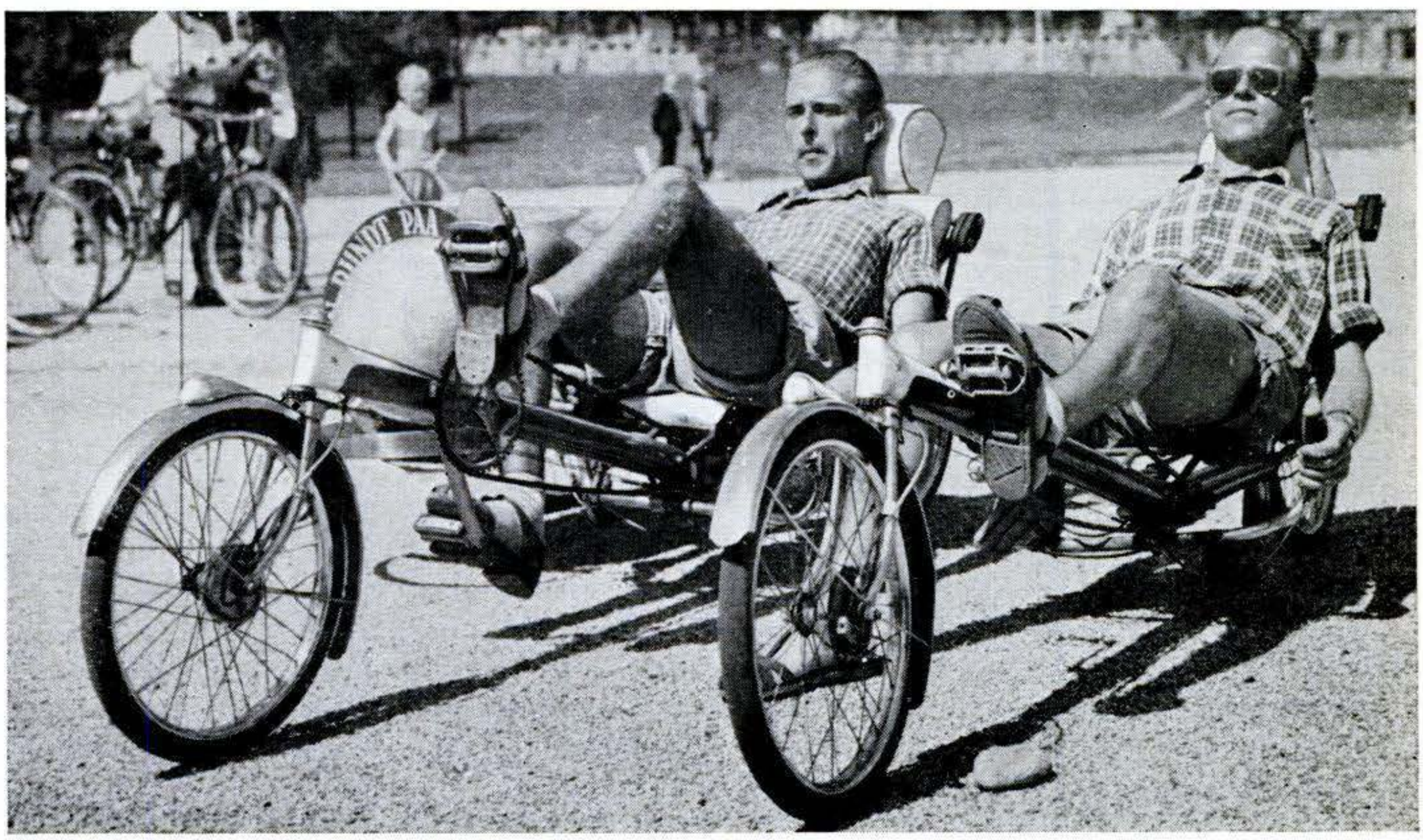


at any defect in the rail, and a following coil generates a small electric current when it passes through the field. Fed into an amplifier, the current then operates moving pens that record the voltage surges on a paper tape (above left).

When a defect is discovered, the train is stopped and the rail is hand-checked by passing a heavy current through the suspected section (above right). The amount of voltage drop at the break shows the seriousness and exact location of the flaw.



"Bed Bikes" Save Work

THESE two cyclists, lying down on the job, are brothers Svend and Knud Nielson of Copenhagen, Denmark. Off on a trip around the world by leg power, they were photographed in Munich, Germany. The oddly designed vehicles, built by the owners themselves, are supposed to take the work out of pedaling. The Nielsons, who began their trip in mid-summer, expect to complete it in three years, financing themselves by peddling pictures of the bikes.

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Shaw Drives

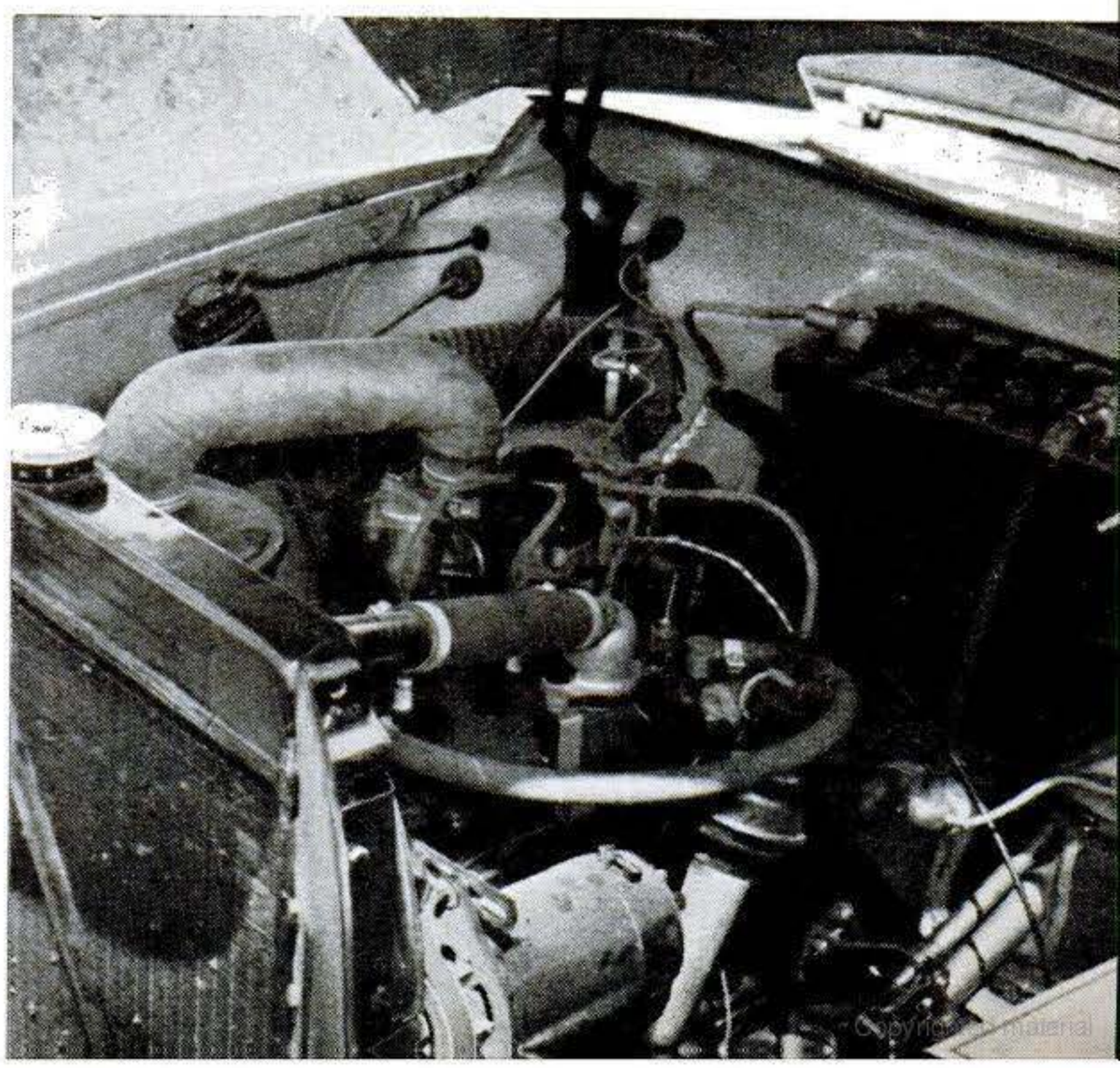
Saucy like its name, the little Hillman gets a lot of oomph out of a few horses —and gives you comfort and economy to boot.

By Wilbur Shaw

European-type turn signal is, I'd say, no more effective than our blinker system, but it's fun to work and a lot more gadgety. This convertible sells for $1,849 unloaded from the boat at any port and ready to roll.

With a wheelbase of only 93 inches, the Hillman Minx provides a commendable amount of room for four people. The windows roll up and down with only one revolution of the handle The gas economy is good: 30 to 32 miles per U. S. (not British) gallon.

The engine runs faster than those of most U. S. cars—as it must, to develop the torque needed for good performance. It's interesting to note that while the British are free with their criticism of our "over-powered" cars, they too have been steadily boosting their horsepowers. Nineteen years ago the ancestor of this Minx engine developed only 27 horsepower. This one delivers 42 hp. at 4,200 r.p.m.



the Minx—"A Neat Little Car"

THE Hillman Minx is a neat little car by any standards, British or American.

I specify that now, before I make any criticism of this popular, English-tailored automobile. Some POPULAR SCIENCE readers really got their dander up over what I said about the Austin and the Henry J last spring.

Marketed in this country by the Rootes Group, the Minx does have its limitations *judged by the demands of motoring on a big continent covered by high-speed roads.* With that understood, let's climb aboard.

Here's the start of the playback from my recording equipment as I slipped into the driver's seat of a Minx four-door sedan at the Indianapolis Motor Speedway.

The instrument panel is well laid out. The Minx has a nice safety provision on its gear-shift—you have to pull lengthwise on the shift lever before you can get into reverse.

Roomy and Gimmicky

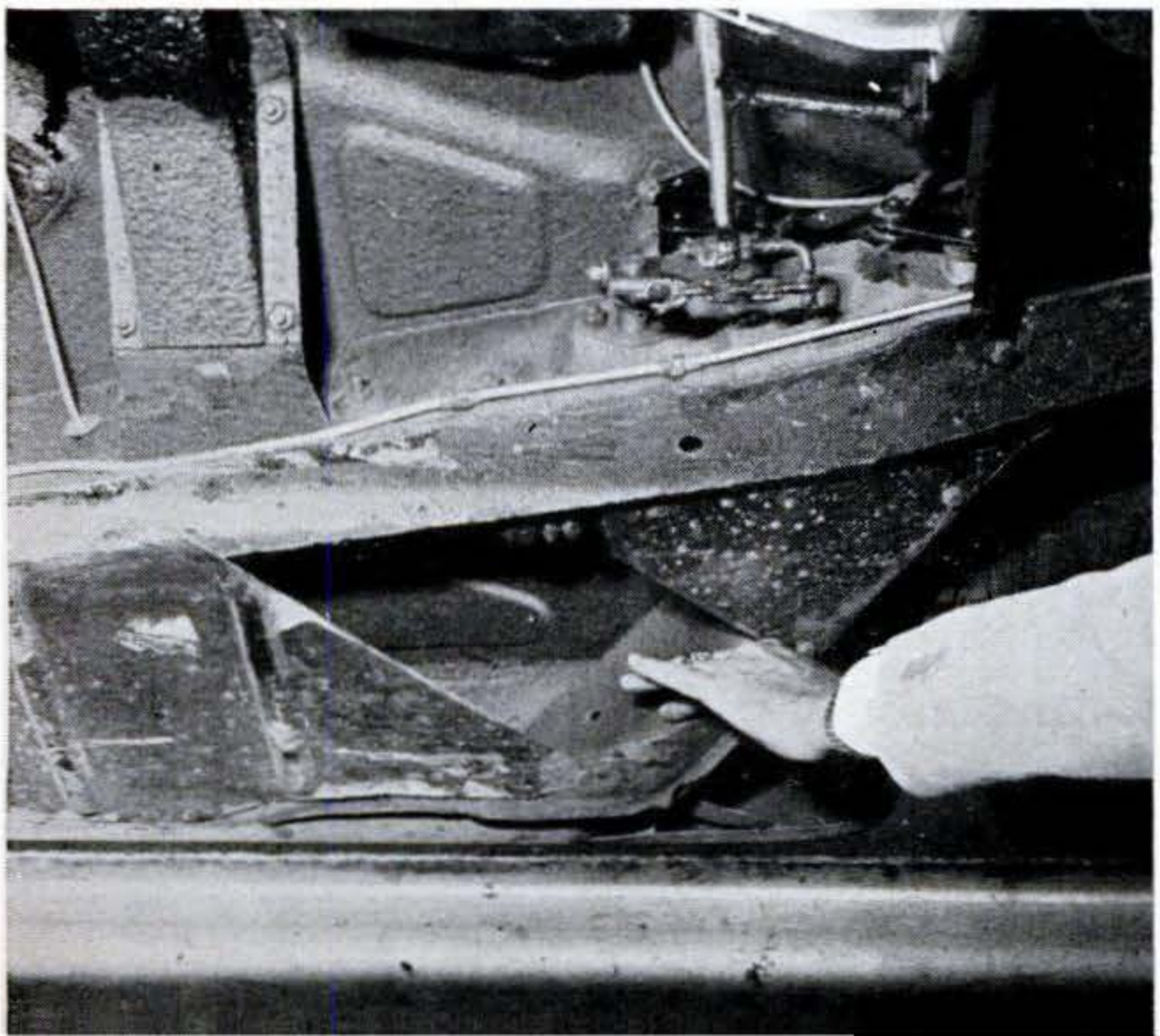
I'm always surprised to discover the amount of entrance room the British build into their little cars . . . you don't have to stoop and squat to get into the Minx . . . and here are those battery and oil-pressure lights that we ought to see on more U.S. cars . . . A green light flashes on if the oil pressure is low, a red light if the battery is on discharge . . .

I pulled on the starter button—that's right, you pull instead of push it—and got the engine to turning over.

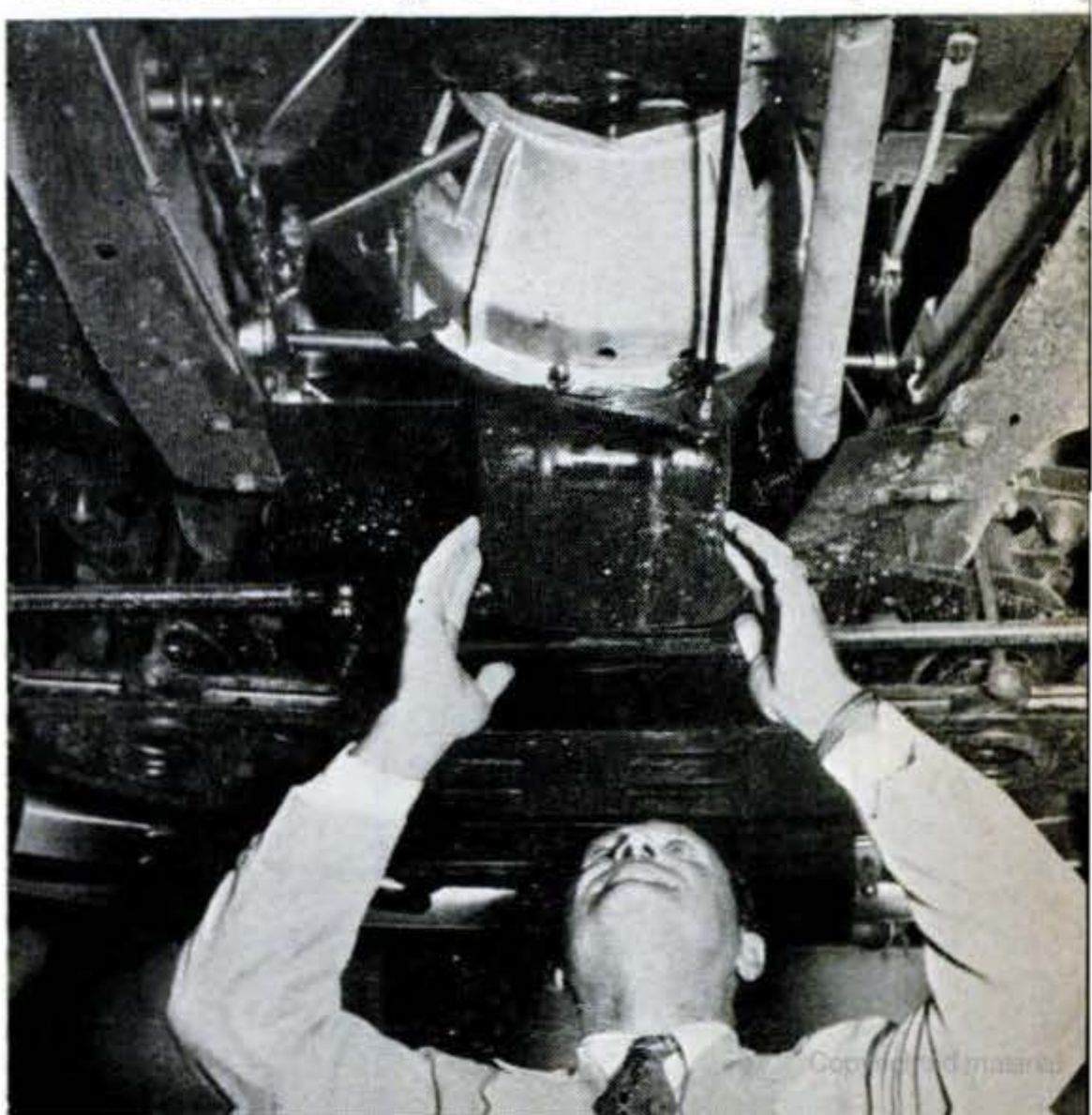
The starter's too noisy . . . which is typically British . . . but the engine catches right now . . . There's plenty of leg room in front as I feel for the clutch . . . but the car obviously gives the rear-seat passengers a snug fit . . . and that's what I mean by its limitations.

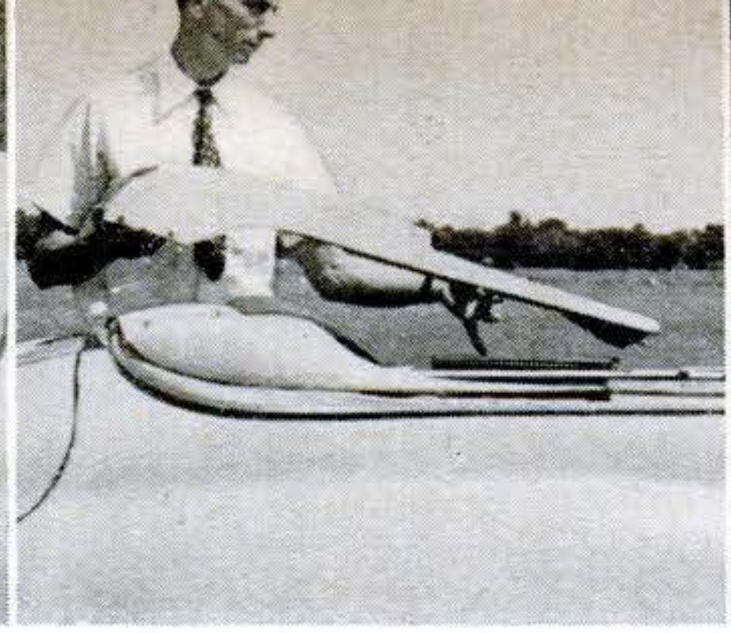
I started around the track, using only the second, third and fourth gears to get torque at the rear wheels. You use first gear only for a hard-pull start—if, for instance, you are

Here's a look at the underside of the Minx chassis. My hand is on a subframe welded on the outside of the regular frame. It serves as a splash member and adds to the rigidity.



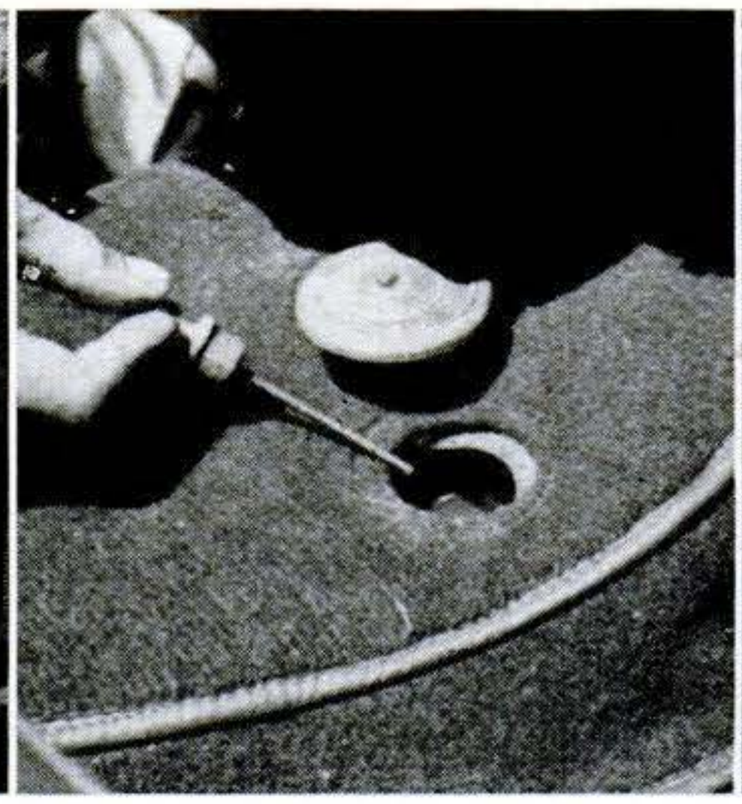
The little crankcase is exactly nine inches square. We had a time getting the car onto a filling-station hoist because of its narrow tread. The tires squeaked on the safety rails.



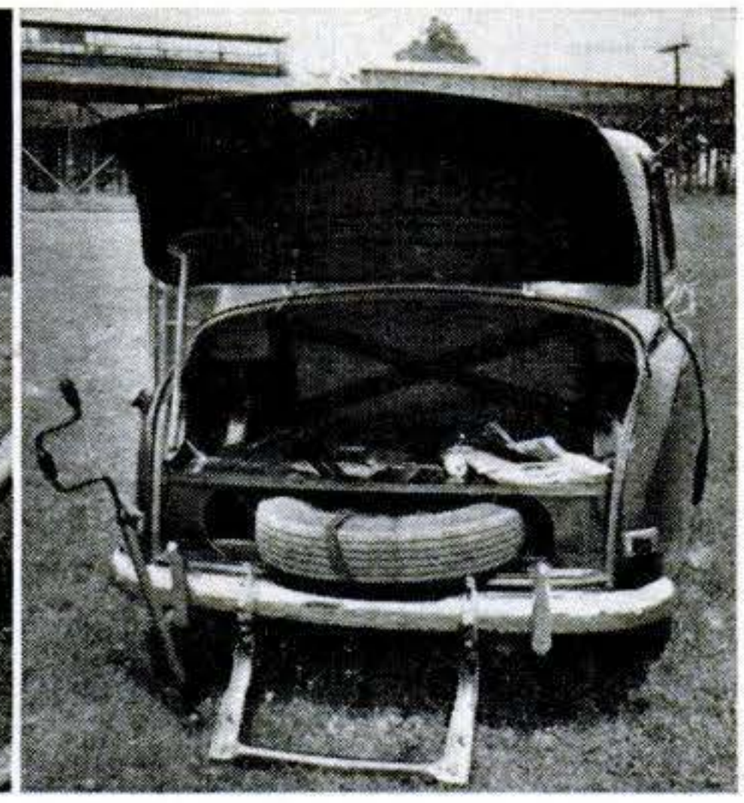


To put up the top—the "hood" to the British—you first have to remove three thin, steel cover plates over the top well. They are shown in position in the picture at the left. The top has a tricky, hinged framework that has to be adjusted manually. But when the fabric is buttoned down, the convertible is about as snug as this type of car can be.

To save space, the emergency-brake handle is on the floor. For U. S. market, the Minx comes with left-hand drive.



This port lets you check your lube level in gearbox. Incidentally, car is not equipped with automatic choke.



Built-in jack posts are a feature of the Minx, as of many other European cars. Spare tire has own compartment.

headed up a hill and need plenty of torque.

The engine revs up considerably . . . as it must with the car's power/weight ratio . . . but it's quite smooth for a four-cylinder job . . . The ride is surprisingly soft.

I did some hard turns at an indicated 60 miles an hour on the broad Speedway track.

There's no perceptible roll . . . This is an amazing little car . . . It keeps its feet on the ground . . . For less than a ton of automobile, it has an odd, comforting feeling of weight . . . The visibility through the windshield is excellent . . . you don't have to look

[Continued on page 268]

FACTS ON THE HILLMAN MINX

Make and model: Hillman Minx Mark IV 4-door sedan.

Engine: 4 cyl. L-head; 42 hp. at 4,200 r.p.m.; car weight per hp., 47.5 lb.; bore and stroke, 2 9/16" by 3¾"; compression ratio, 6.63:1; piston displacement, 77.2 cu. in.

Engine piston travel: (in feet per car mile at 20 m.p.h.)—2,670.

Crankshaft bearing surface: 25.62 sq. in.

Torque: 58.3 lb.-ft. at 2,200 r.p.m.

Transmission: 4-speed manual.

Rear-axle ratio: 5.22:1.

Steering ratio: 14.6:1.

Radius of turning circle: 16½'.

Effective brake-lining area: 92 sq. in.

Springs: front, coil; rear, semi-elliptic.

Weight and outside dimensions: 1,995 lb.; height, 60"; over-all length with bumpers and guards, 157.25"; width, 62"; wheelbase, 93"; overhang, front 24", rear 39¾"; tread, front 48.6", rear 48.5".

Inside dimensions: seat-cushion width, front 50¼", rear 40¼"; leg room, front 39", rear 25½"; headroom, front 37¾", rear 36½"; seat height, front 12¾", rear 15"; vertical distance, steering wheel to seat cushion, with seat in mid-position, 7"; front-seat adjustment, horizontal 5½" (no vertical seat adjustment).

Tire size: 5.50 by 15.

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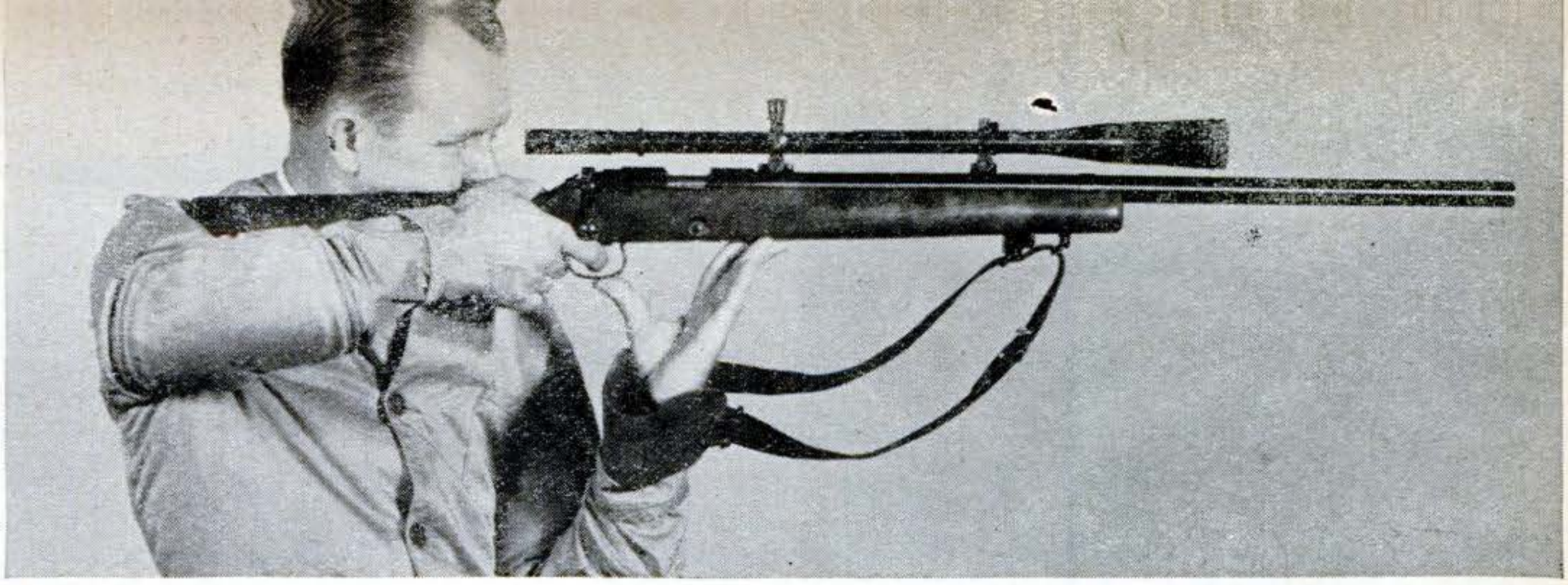
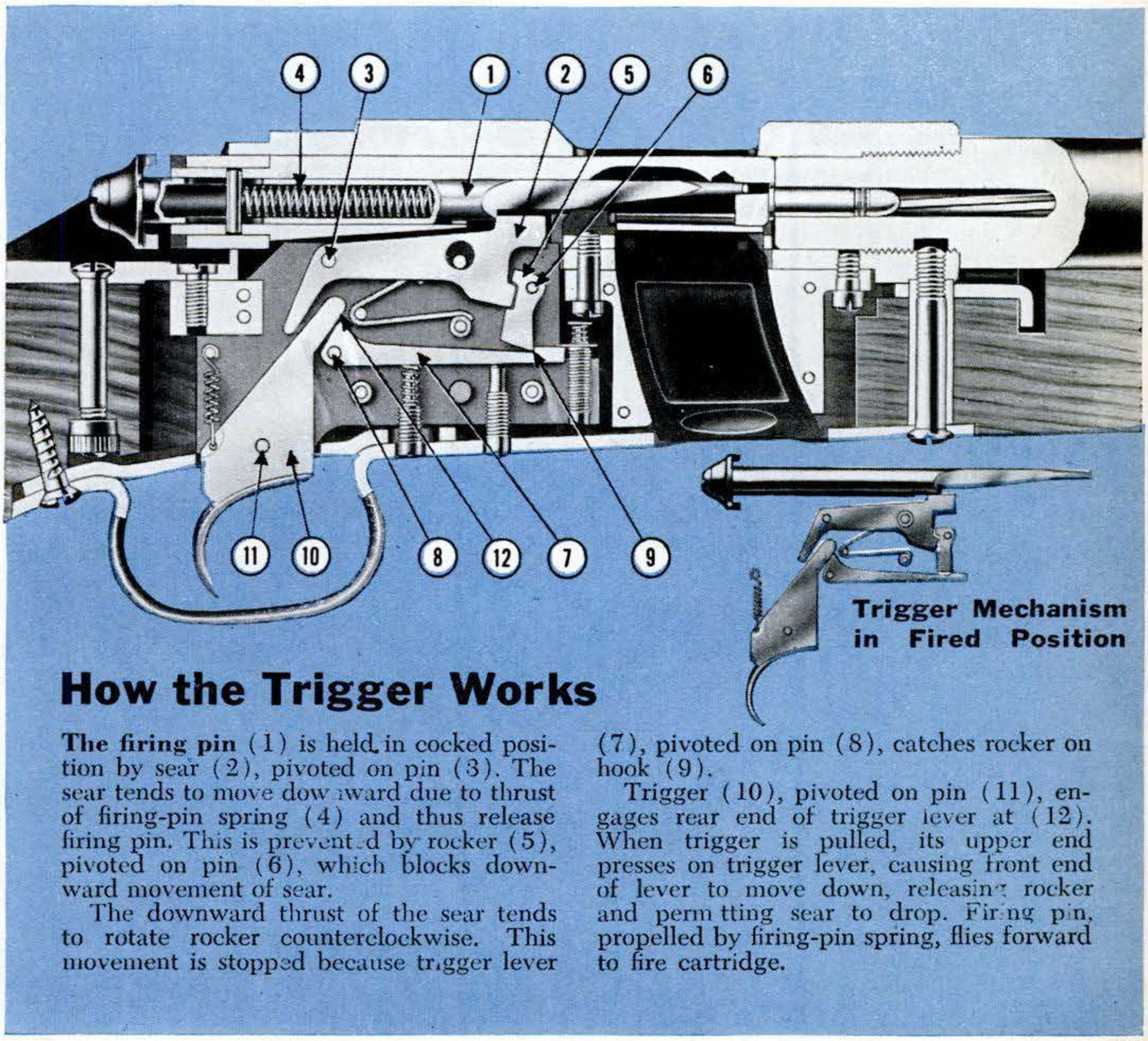


Dave Carlson, former national smallbore champion, tests the new "Micro-Motion" trigger.

New Rifle Trigger Cuts Vibration

MOVING the trigger as little as three thousandths of an inch is enough to fire a new marksman's rifle. This faint pull is multiplied nearly five times by a system of levers to provide the fairly large movement necessary to disengage the sear that holds the firing pin back. The new design, says the manufacturer, practically eliminates aim-spoiling trigger vibration.

Screw adjustments underneath the rifle permit the marksman to vary the stiffness of the trigger and the total distance it moves. It is a feature of Winchester's latest .22-caliber Model 52.



How the Trigger Works

The firing pin (1) is held in cocked position by sear (2), pivoted on pin (3). The sear tends to move downward due to thrust of firing-pin spring (4) and thus release firing pin. This is prevented by rocker (5), pivoted on pin (6), which blocks downward movement of sear.

The downward thrust of the sear tends to rotate rocker counterclockwise. This movement is stopped because trigger lever (7), pivoted on pin (8), catches rocker on hook (9).

Trigger (10), pivoted on pin (11), engages rear end of trigger lever at (12). When trigger is pulled, its upper end presses on trigger lever, causing front end of lever to move down, releasing rocker and permitting sear to drop. Firing pin, propelled by firing-pin spring, flies forward to fire cartridge.

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Signal Lights Guide Bomber for Night Air Refueling

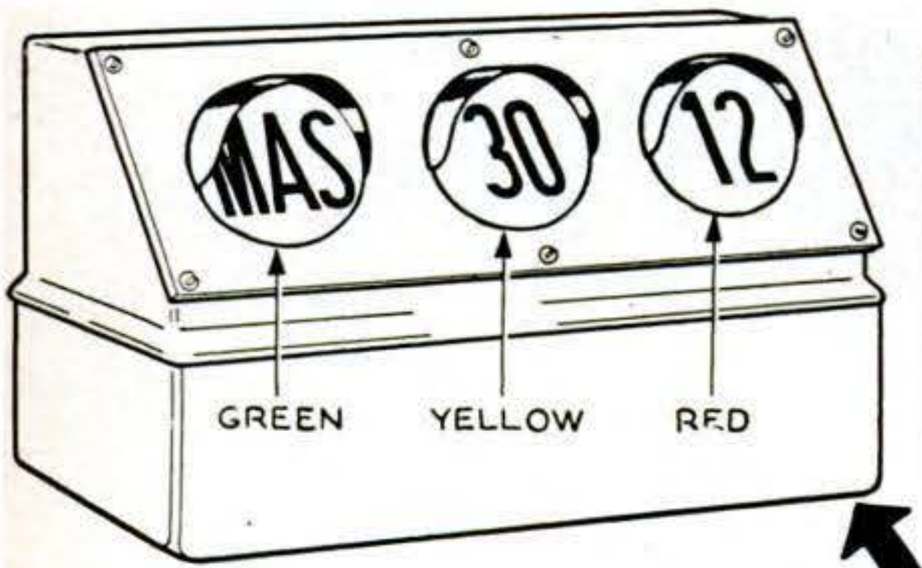
IN DAYLIGHT or darkness, U. S. Air Force bombers can now refuel in mid-air (above) to gain range and striking power. Newly developed signal lights on the belly of the tanker plane (left) direct the tricky maneuver. Through microswitches, the position of the tanker's telescopic refueling boom controls the signal lights automatically. When the boom is extended and at the correct angle, a panel at the center of the signal board displays a green light to the bomber pilot. If the green light goes out, and one of four red panels lights up, the bomber is getting out of position. The red panel tells the bomber pilot whether to move up, down, forward or aft to avoid breaking the connection.

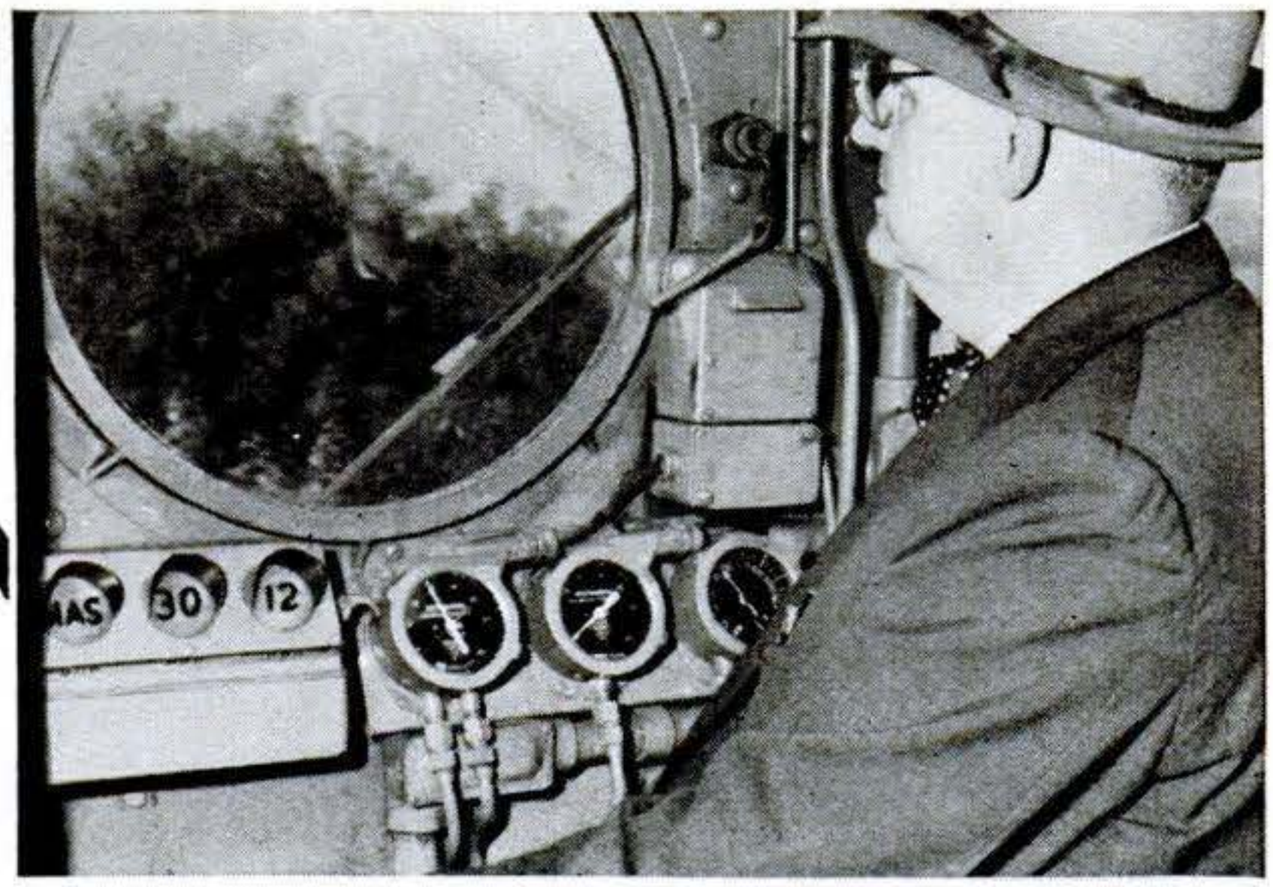
Wreckproof System Safeguards Commuters

ON AN 18-mile stretch between New York City and Port Washington, N. Y., Long Island Rail Road trains now run under automatic speed control, the first installation of this "wreckproof" system by the world's busiest commuting railway. Completion next year of 73 miles of similarly equipped lines will safeguard passengers on other routes to the suburban communities of Long Island.

The Long Island's system makes it impossible for a train to exceed 12 m.p.h. in an occupied block, or 30 m.p.h. approaching one. If an engineer disregards a speed-limiting block signal, a speed governor takes control away from him and applies the brakes. They cannot be released until the train slows down to a safe speed.

Minor differences from a similar new Pennsylvania R. R. system (PS, July '51, p. 50) are a two-speed instead of a three-speed governor, and cab signals with letters and numerals instead of semaphore symbols.





Signals in engineer's cab of Long Island multiple-unit electric car repeat wayside block signals that show either maximum authorized speed (MAS), 30 m.p.h. or 12 m.p.h. If engineer disregards a signal requiring a slowdown, train's brakes function automatically.

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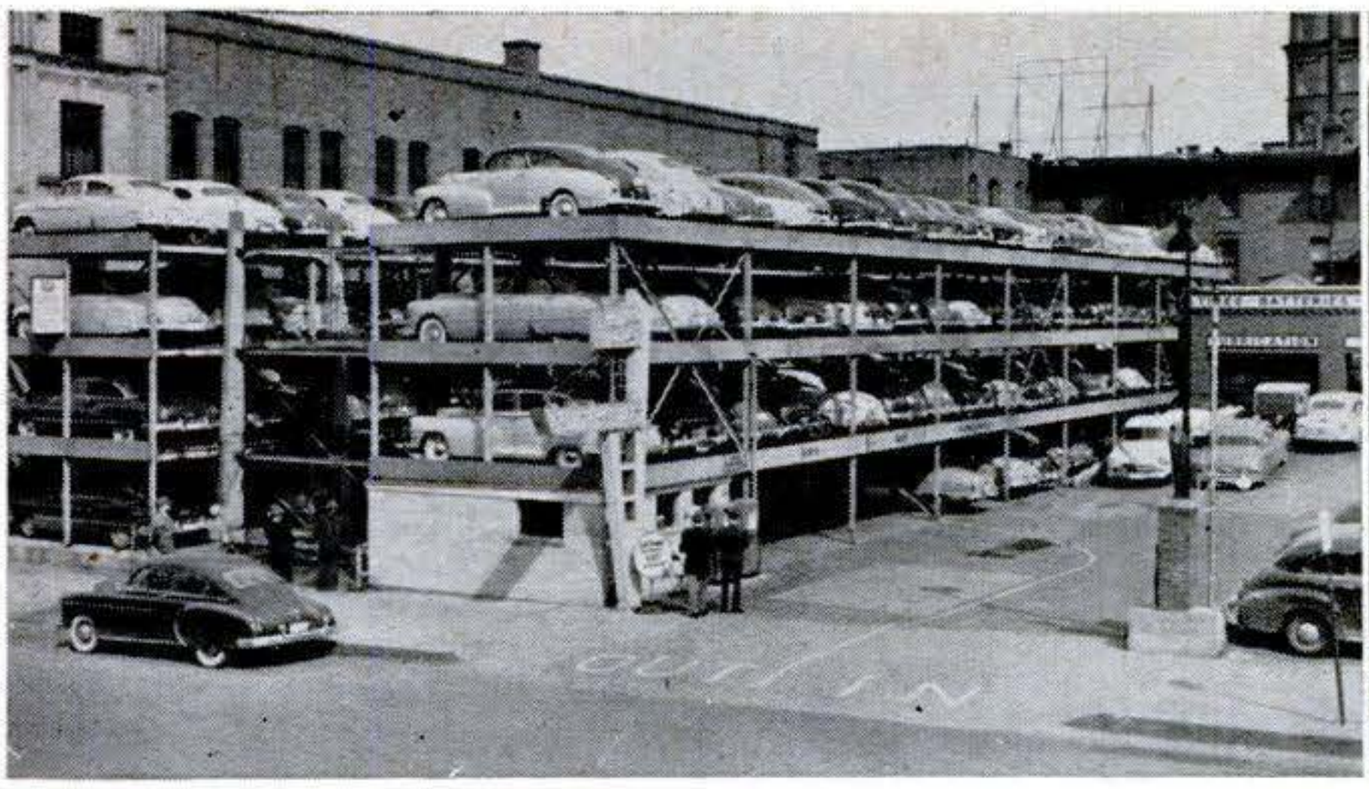
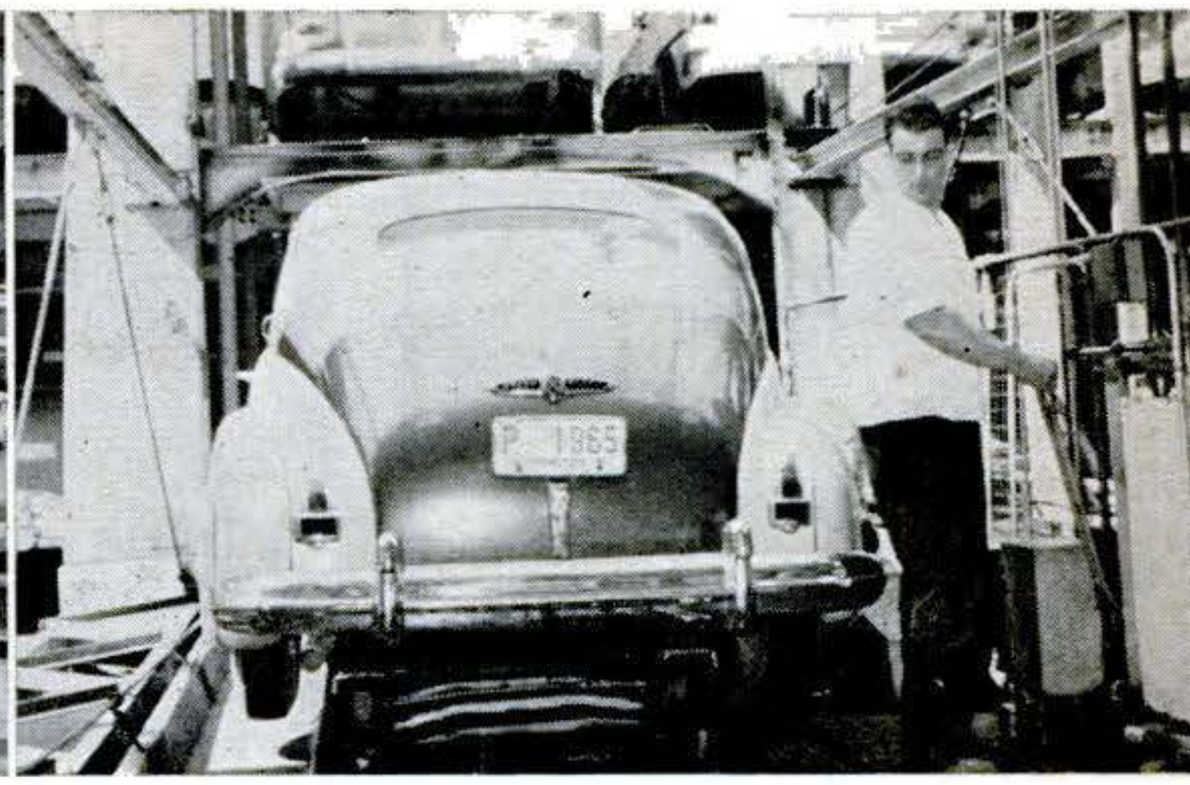


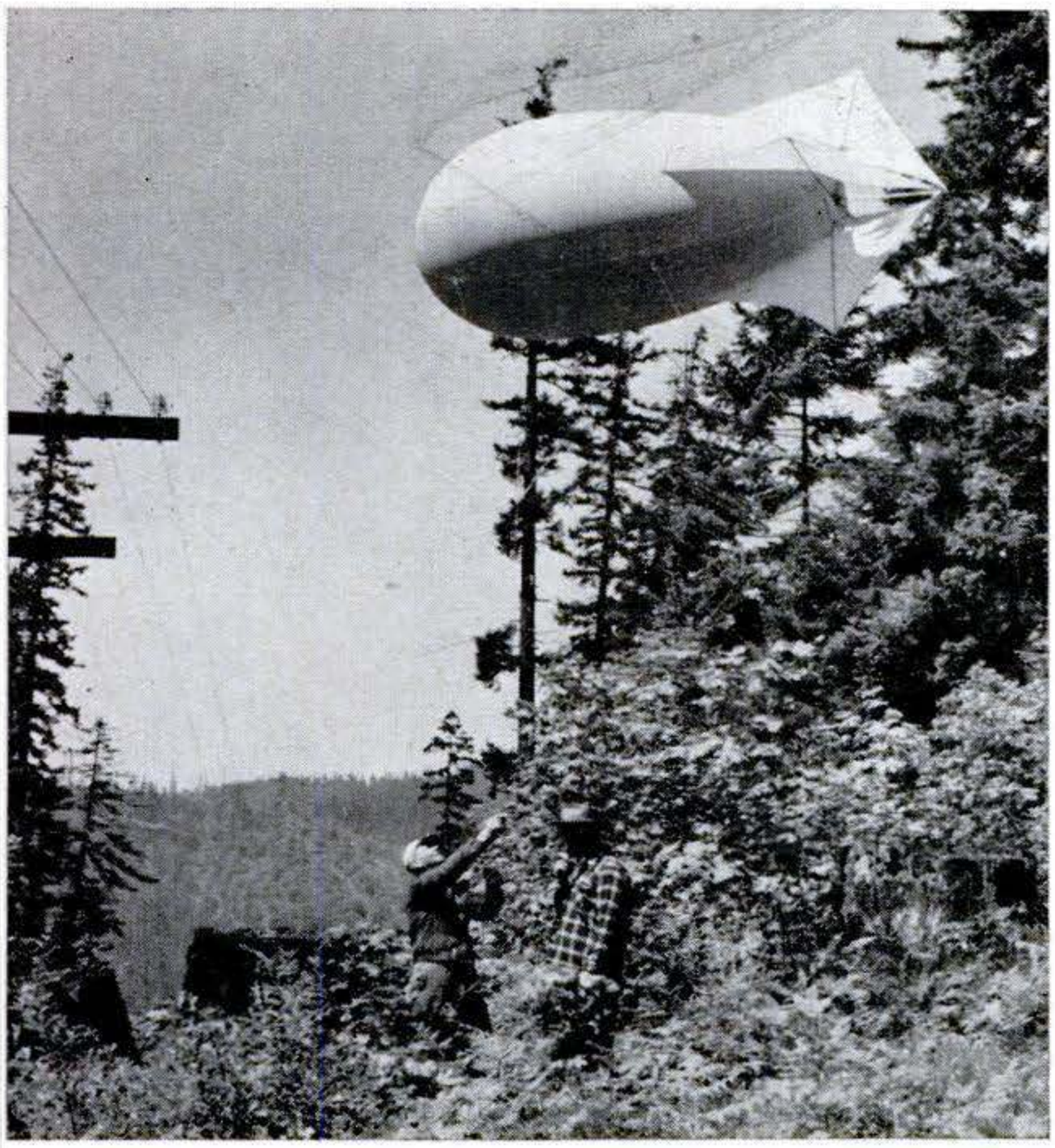


Pigeonhole Storage Helps Solve City Parking Problem

A MOTORIST who leaves his car at this four-level parking unit in Spokane doesn't have to worry about scratched fenders. Once he drives into a street-level entrance stall, no one touches the car until he returns. An elevator moving along an alley between the two storage tiers stops in front of the car waiting to be parked. A dolly slides out, raises the car 10 inches off the ground, and loads it on the elevator. The operator then moves the elevator along the alley and up to the level where the dolly deposits the car in a vacant pigeonhole. In photo at right above, operator is moving a car out of its pigeonhole for delivery to a customer.

Balloon Locates Towers

ENGINEERS used this Kytoon (kite-balloon) to measure height of relay towers for a line-of-sight microwave communications system along the Southern Pacific Railroad in Oregon. When men over the ridge say they see the balloon, markings on the string show the tower height.



75 years ago this month

Popular Science Monthly reported:

"AFTER a very thorough investigation of the advantages possessed by different kinds of pavements—granite, asphalt and wood—the corporation of London has decided in favor of the last. The report of the city engineer shows that a horse traveling on a granite pavement may be expected to fall once for every 132 miles traveled, on asphalt once in 191 miles, and on wood once in 446 miles."

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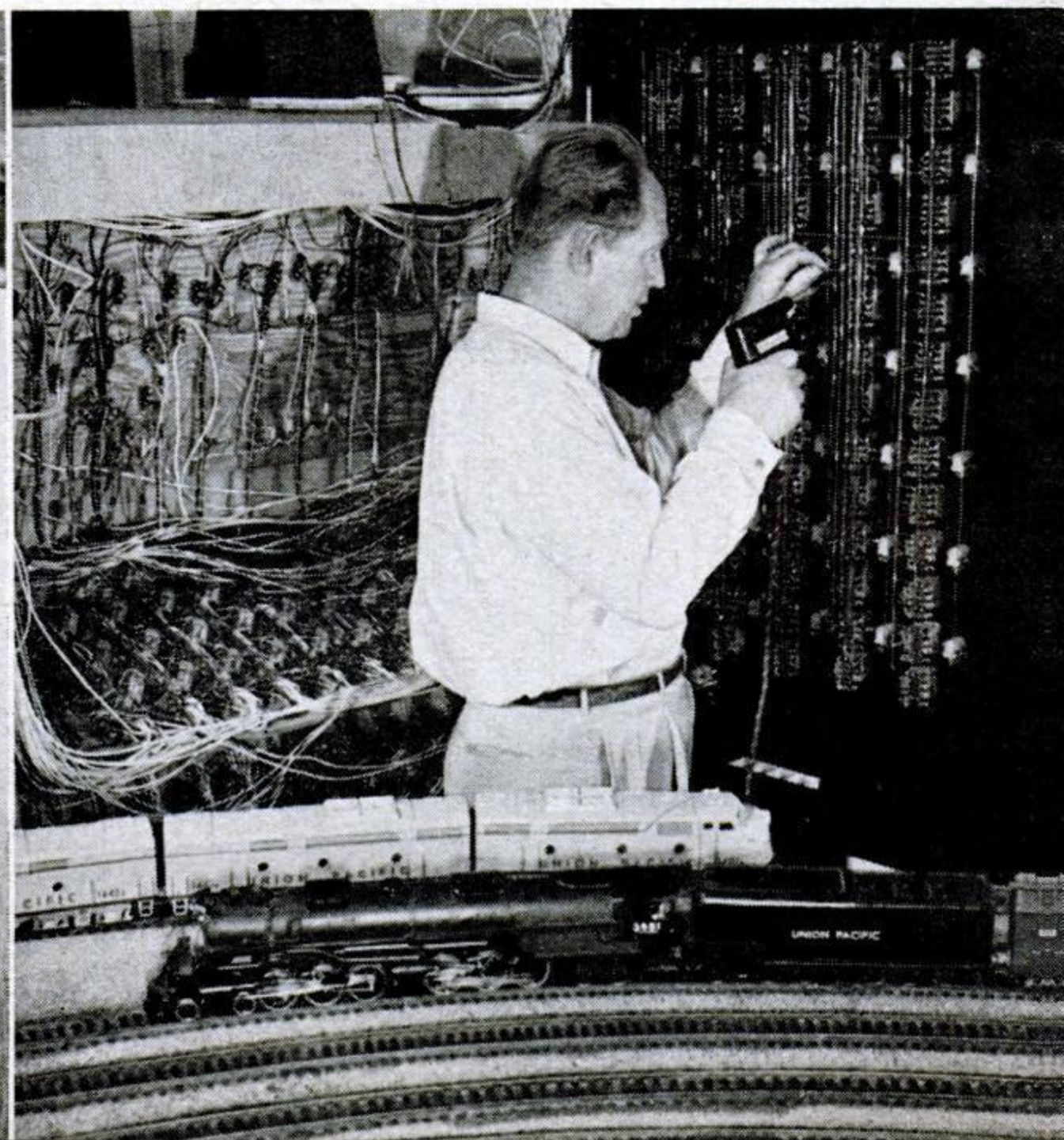
Comin' 'round the mountain, multiple-unit F-3 freight Diesel eases through precipitous pass, modeled to represent part of Rockies. Bridge in foreground carries upper level of tracks.

From single control panel, Mr. Friedrich operates entire model railroad. Toggle switches, arranged on map of layout, actuate corresponding signals, switches and tracks on railroad.

Maze at rear of control panel is part of 300 relays and 11,000 feet of wiring that connect panel to tracks. In foreground are three-unit Diesel and big 12-wheel-drive UP Challenger.



His Private Railroad Rivals Best Big Lines

This California minister runs his mammoth model from an easy chair with real Centralized Traffic Control.

By Andrew R. Boone

SEVERAL evenings each week a California minister roams the western United States without getting out of his chair. He is James K. Friedrich, pastor of St. Michael and All Angels Episcopal Church, Studio City.

He tours thousands of square miles of desert plains and towering mountain peaks by simply flipping switches on a board of electrical controls. As he manipulates inch-long levers, model trains labor up long upgrades, pound around banked curves, and streak through tunnels in a railroad system that includes 3,300 feet of track, 28 locomotives, 50 passenger cars and 145 freight cars.

Occupying a room 30 by 50 feet, the O-gauge (¼-inch scale) railroad is believed to be the largest layout owned by one man. Certainly it is one of the few club-size roads that can be run by a single operator sitting at a single, mammoth control panel.

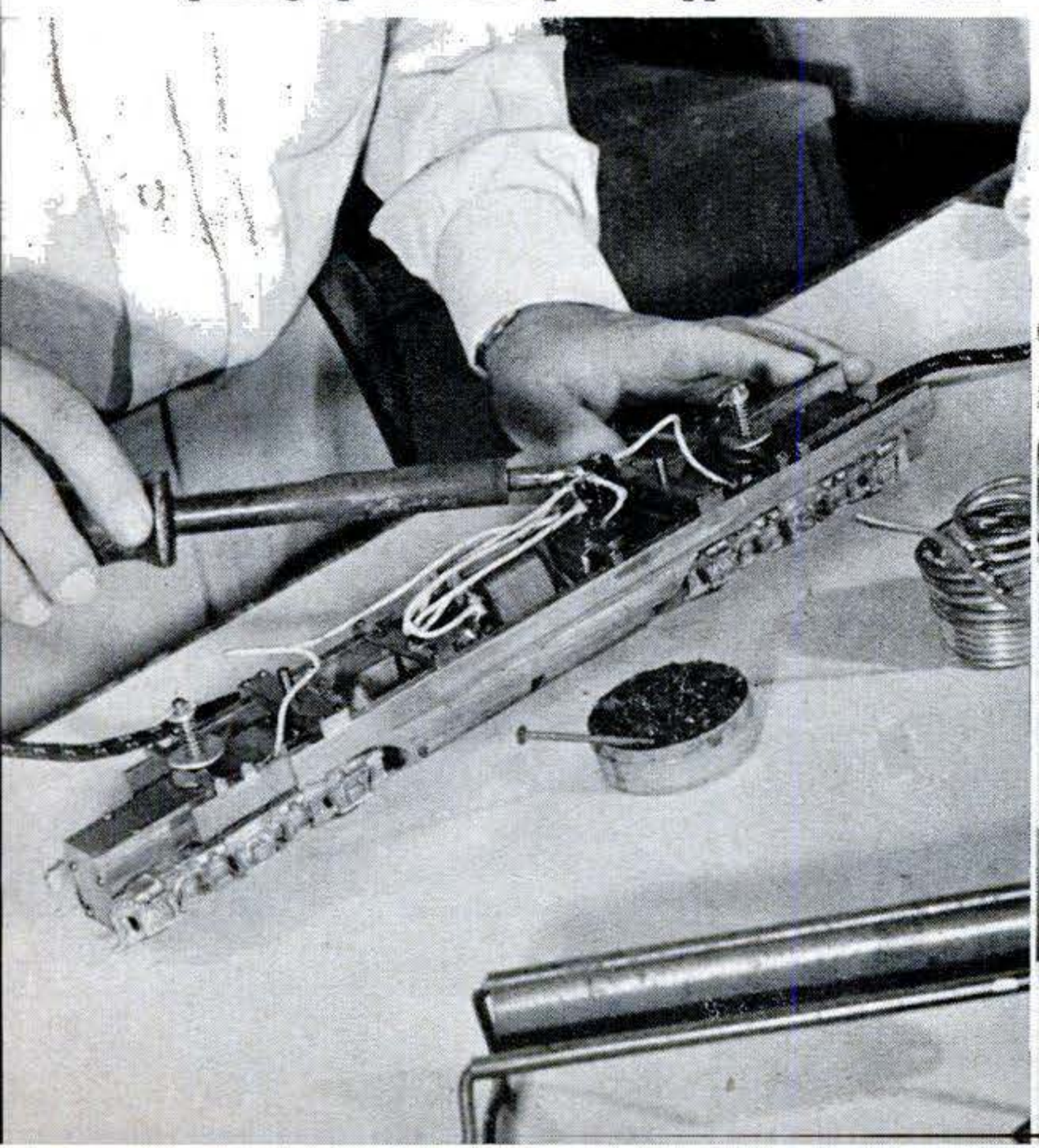
This is done through a miniature version of CTC—Centralized Traffic Control—the same system used by big railroads that permits one man to know and control the traffic over an entire division. Through 300 clattering relays that automatically actuate signals and turnouts, Mr. Friedrich can operate up to four trains simultaneously over the multiple-track system.

Can Run Railroad "Blind"

Scores of flashing indicator lights, arranged in map fashion on the panel, tell him exactly where every train is located at all times. Nearly 100 toggle switches enable him to turn power on or off in any section, so that each train can be started or stopped anywhere. Some sections are even powered through separate rheostats so the speed of each train can be varied independently.

If he wants to, Mr. Friedrich can run the

Connections are soldered for a 24-volt, 1/20-hp. electric motor in main frame of big passenger Diesel. All locomotives were handmade from photographs and blueprints supplied by railroads.



Multiple-unit F-3 freight Diesel gets delicate paint trim by professional modelmaker Lewis Upshaw. Union Pacific buys most of its models from Upshaw, some costing $1,500 apiece.

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railroad "blind," watching only the big, blinking control board to keep tabs on his trains.

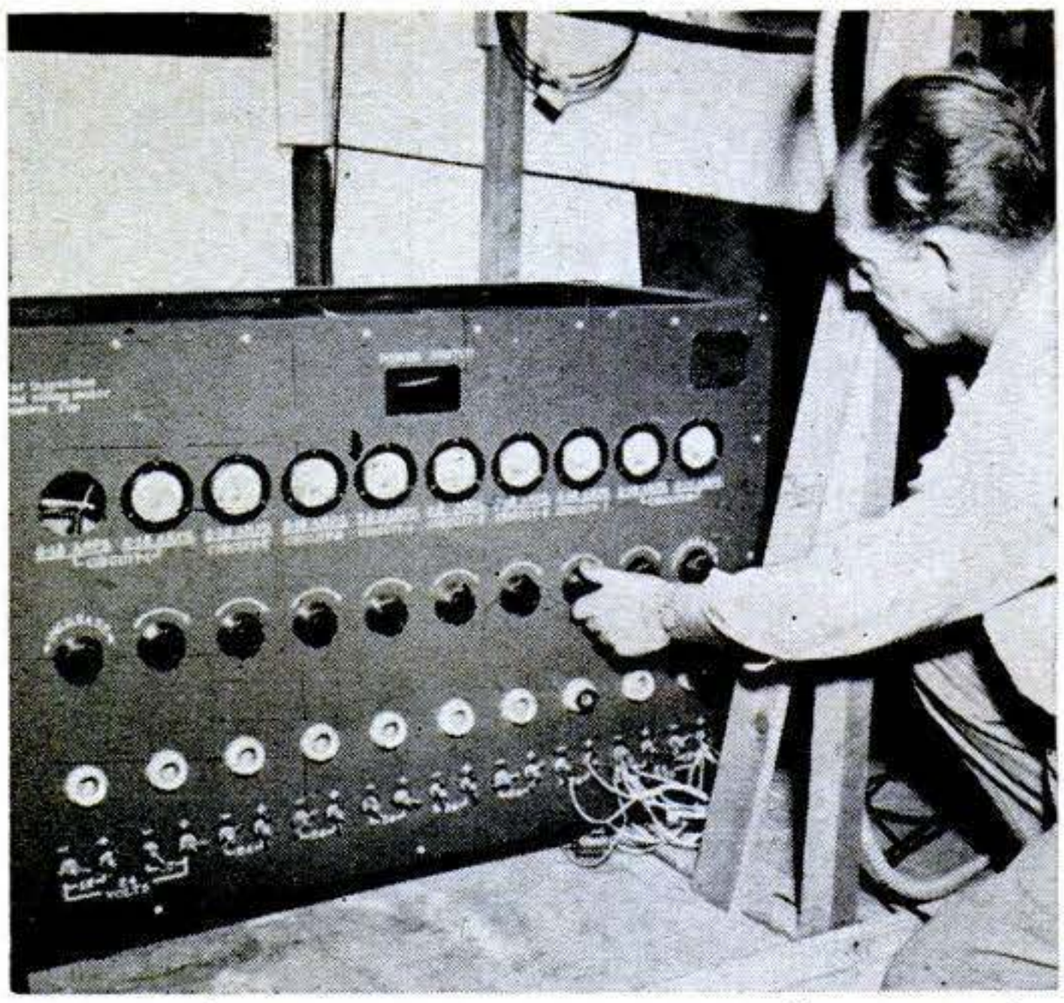
The trains run over the full-scale equivalent of 50 miles of tracks. As a Southern Pacific freight heaves into view, rolling up a California valley, the tail light of a Union Pacific crack passenger express disappears around a Utah mountain. They're only 30 feet apart actually, several hundred miles apart scenically.

Rev. Friedrich didn't build his railroad out of the Sunday collection box. When he isn't tending his parish, he directs the making of religious movies as president of Cathedral Films, Inc., in Hollywood. Out of this enterprise has also come valuable experience in set design that has helped him create the scenic effects on his railroad.

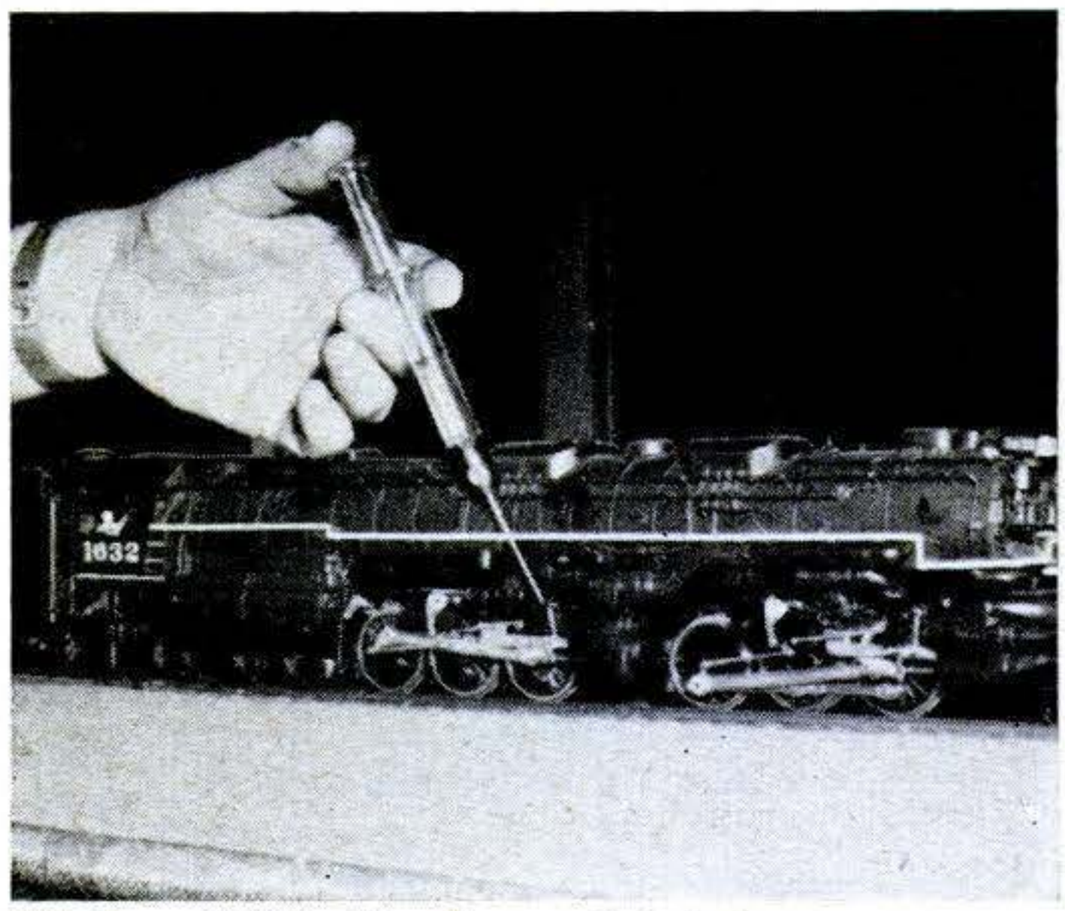
Locomotives Made by Pros

Mountains, valleys and arid deserts, artfully contrived out of painted paper and cardboard, provide a changing panorama of western scenery for the multi-level track system. Bridges, stations, farm homes and industrial buildings dot the landscape. Sprawling ladder-track classification yards are complete with roundhouse, turntable, water tanks and Diesel-servicing stations.

All of the 28 locomotives are precise, handmade reproductions built for him by two professional modelmakers, Lewis Upshaw and Ray Waller. They range from tiny switchers to giant multiple-unit road Diesels and mountain-climbing steam locomotives. Each is powered by a single 1/20-hp. electric motor that enables it to pull nearly 100 cars. That's as much as the real thing can do. END

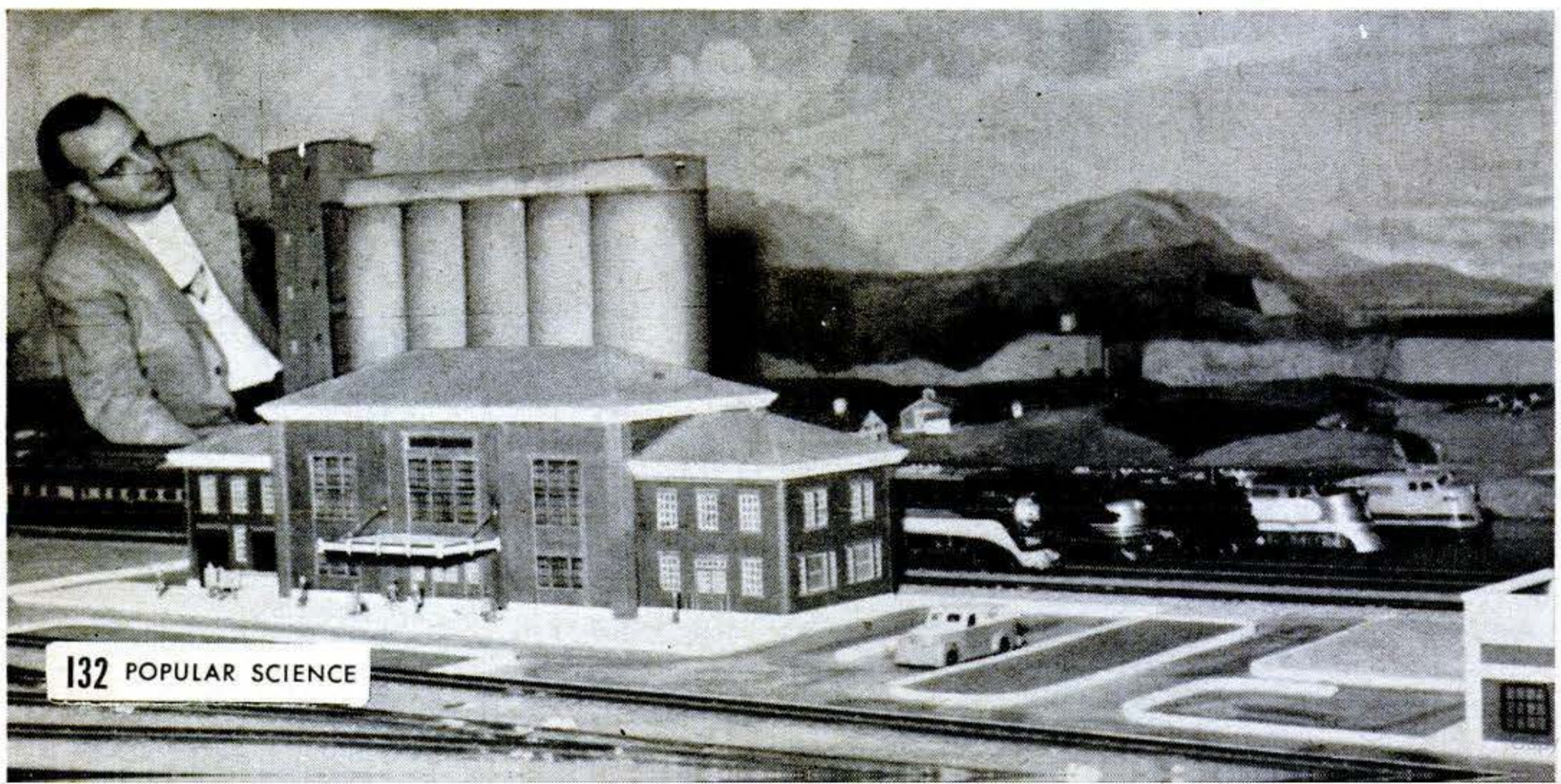


Huge power supply is war-surplus aircraft-battery charger. Its rectifier has 220-volt input, delivers 10 separate circuits of 24 volts each, and can supply 285 amps continuously.



Mighty C&O Allegheny 2-6-6-6 gets its main journal bearings lubricated with movie-projector oil from hypodermic syringe. This was one of last big steam locomotives built by railroads.

Giant grain elevator carries out railroad's western motif. Mountains and clouds in distance are painted backdrop. Multiple-track main line holds five full trains side by side.



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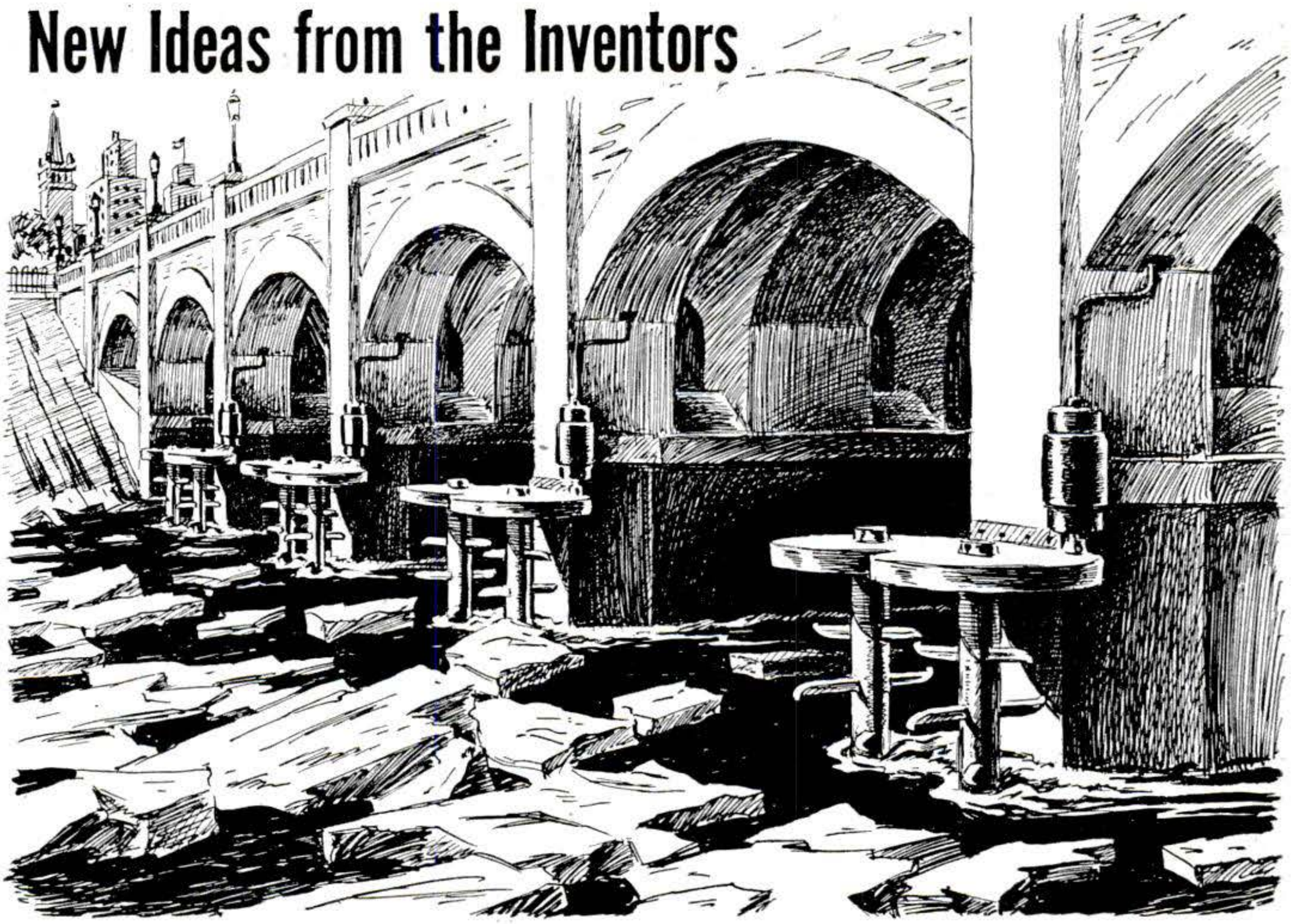
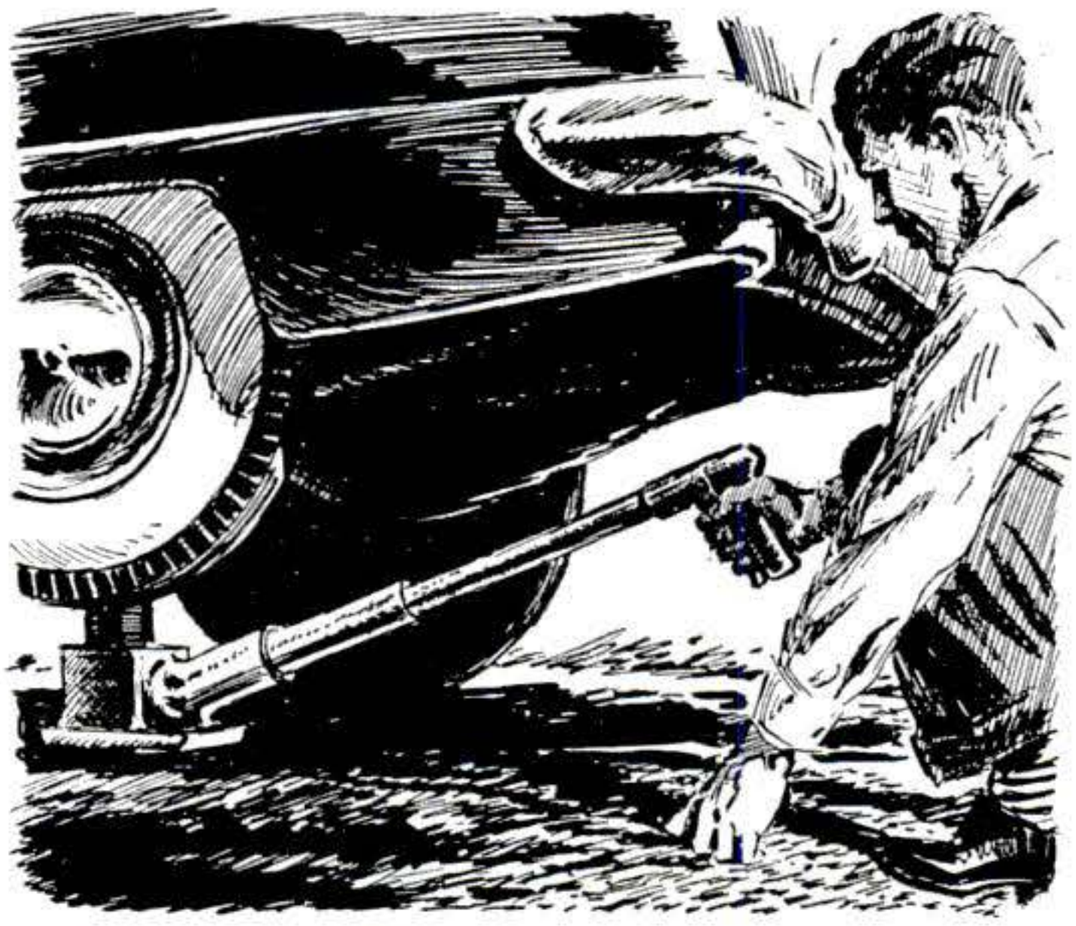
New Ideas from the Inventors



1 Ice Breakers to Protect Bridges. These oversize "meat grinders" would break up ice as fast as it formed around a bridge, preventing large floes from damaging the piers and keeping dangerous jams from building up. Each grinder consists of two spiked columns rotated in opposite directions by an electric motor. The spikes grind up the ice and push the chunks away from the bridge piers.



2 Trigger to Pump Up Car Jack. Axle jacks with folding, detachable handles often are hard to put into place and to operate. This hydraulic-jack design is intended to eliminate these troubles. It would have a rigid, attached handle terminating in a pistol grip to aid in placing it. Squeezing a trigger pumps up the jack.

3 Turntable Boxcar to Aid Loading. Pivoted at the center, the body of this boxcar could be rotated so that both sides and both ends could be reached from a single loading platform. Doors at each end, as well as at the sides, would permit loading at all four points, speeding packing and simplifying even distribution of cargo.

Please turn the page for three more new ideas.

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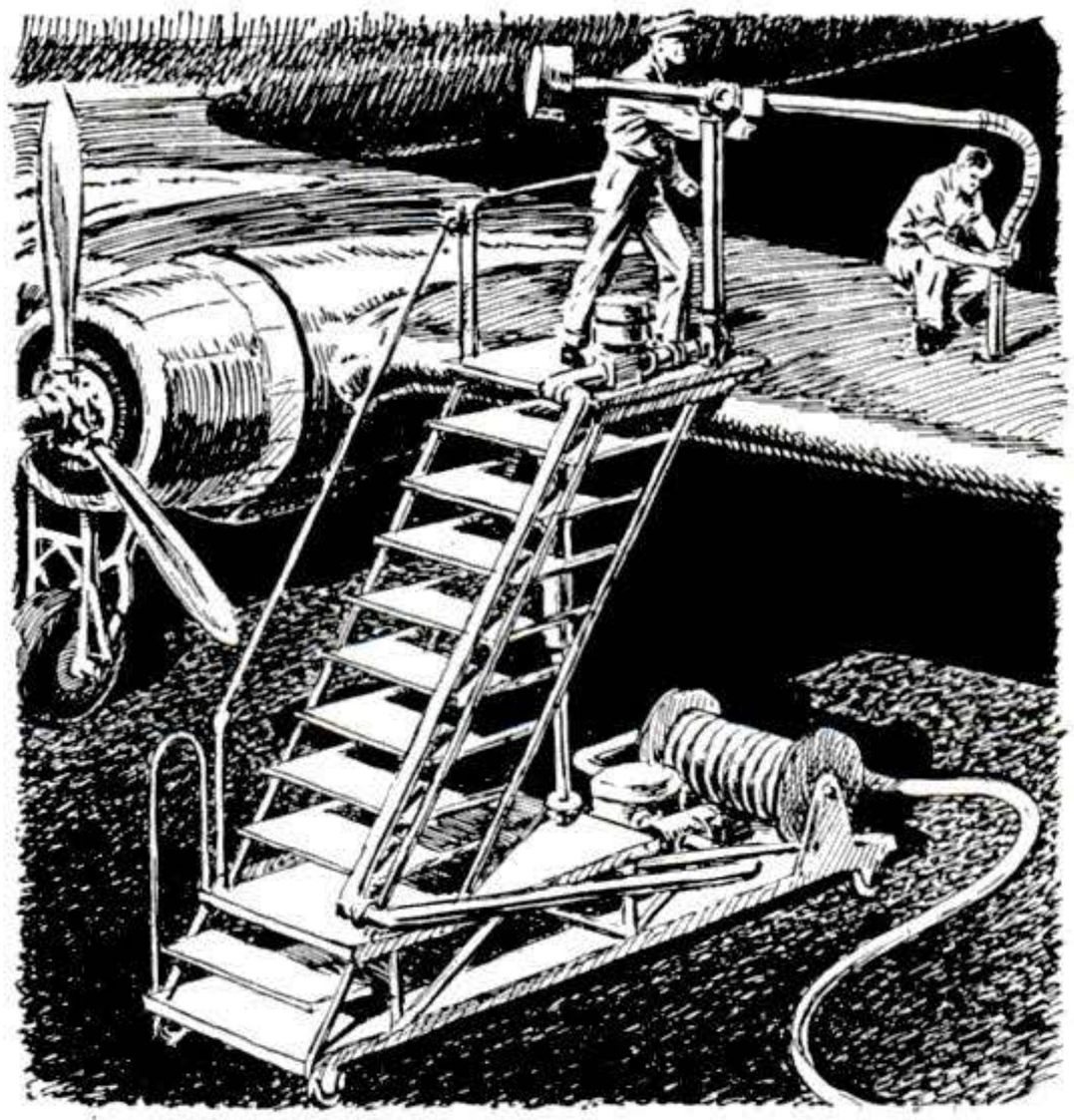
MORE New Ideas from the Inventors

4 Home on Wheels to Have Garage. This motor coach fitted out as a rolling home would also house a small car for shopping chores and short side trips. An electric motor, controlled by a key-operated switch, would open and close a hinged rear door and also lower and raise a ramp. A safety switch, operated by a bumper along the bottom edge of the door, would stop the motor automatically if the door struck anything.

5 Motor to Drive Garden Spade. This design for a motor-driven spade promises to lighten the hard work of gardening. As the wheeled carriage moved along under its own power, a spade blade would be alternately pushed into the dirt ahead and pulled out. On the outward stroke, the spade would turn to throw the dirt to one side.



6 Platform to Speed Plane Servicing. Airplanes could be fueled in half the time it now takes if this mobile fueling unit were used, the inventor claims. His plans call for a counterbalanced fueling arm connected by hose to a central gasoline supply and mounted on a wheeled platform that can be raised hydraulically.

Patents on these inventions have been granted to: 1. J. Musial, Detroit; 2. J. Phenning, Winona, Minn.; 3. F. Holmes, Philadelphia; 4. C. Rice, Daytona Beach, Fla.; 5. J. Bolongaro, Charlbury, England; 6. J. Short, East Orange, N. J.

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Portable electric saw at right is probably most common tool in home building today. Homelite generator (below) powers saw and most of other tools used.

Portable Machines Build Houses Fast

You can find power tools for every job, rent them for as long as you want, and learn to use them in a few minutes.

MACHINE-MADE houses are going up all around you. Not stamped out like so many Fords by giant machines on a factory assembly line, as economists predicted. But built on the spot to individual designs by small machines that go anywhere.

This quiet revolution in home construction has been brought about by two types of machines: engines that can produce power wherever it is needed, and portable tools which use that power to build houses faster and better than ever before.

Already the handsaw and the pick and shovel have been practically outmoded by the power saw and the bulldozer. The hammer may be next—a pneumatic nailer can fasten subfloors in seven houses in a day.

There's a power tool for nearly every building job. One company alone makes 125 different types—plus 40 *categories* of accessories. There's a saw that can cut anything from sheet metal to drain tile. There's a gasoline hammer that can dig postholes through frozen ground. There's a pipe pusher that can ram four-inch water mains straight through the ground—only a short starting trench is needed.

Most of these machines, moreover, are

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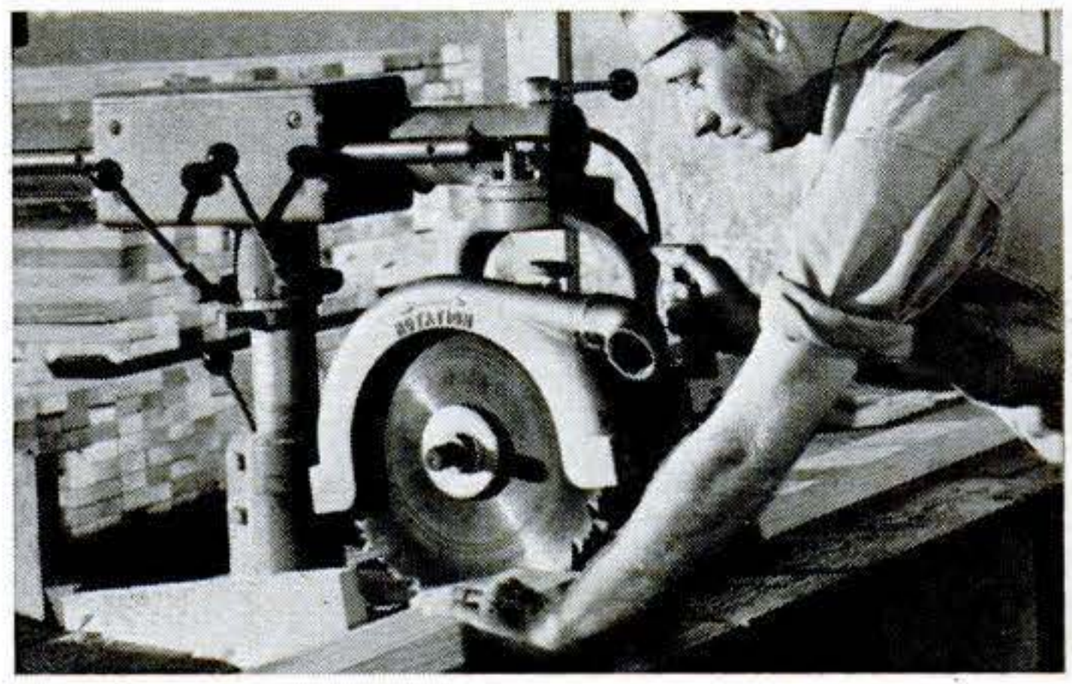
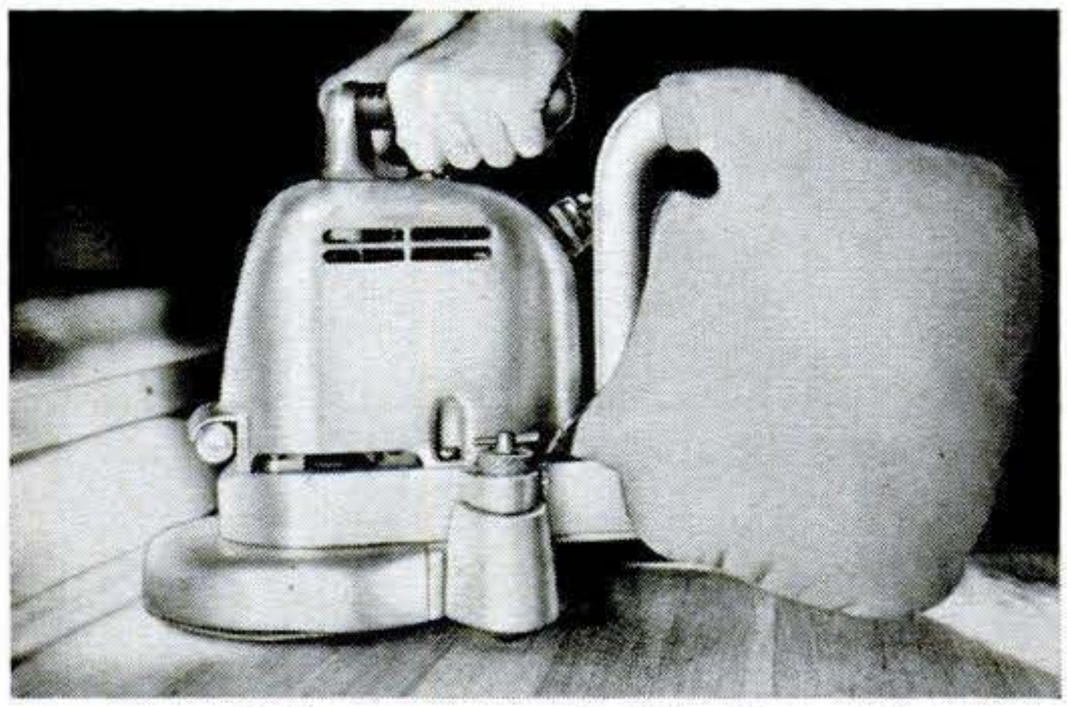
FROM CLEARING THE SITE UNTIL A HOME IS

Trees are cut by chainsaw, saving time and money over old hand-sawing method.



Lumber is cut to size on site or at lumber-yard by powerful radial saw.



Corners of floors are sanded by floor edger, which can get into all the tight places.

Holes big enough for pipes are made straight overhead by electric drill with wood auger.

Subfloors are nailed by Nu-Matic nailer. One man nails 5,000 sq. ft. a day.

Pipe is threaded automatically at home site. Generator provides power.

easy to use. "Given the right instructional material," says one manufacturer, "10 minutes' reading time makes anyone competent."

And the power to run them is available anywhere, no matter how remote the job. In developed areas, it is usually electricity from a temporary outlet that the power company puts up. Or maybe the builder "borrows" from an outlet in a neighbor's house.

But frequently the contractor takes his own power with him. A generator like the one shown on page 135 will provide both high-cycle (230 volts, 180 cycle) AC for high-cycle tools like some chain saws, radial

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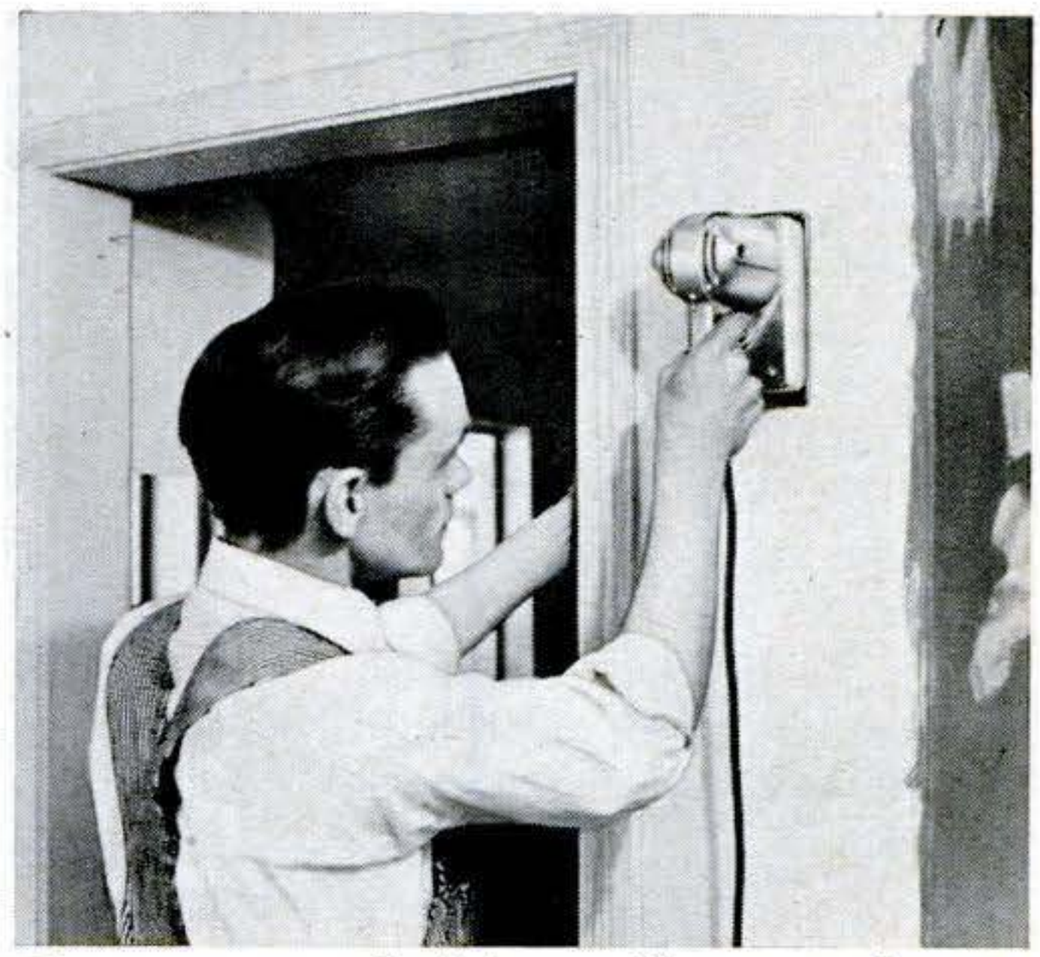
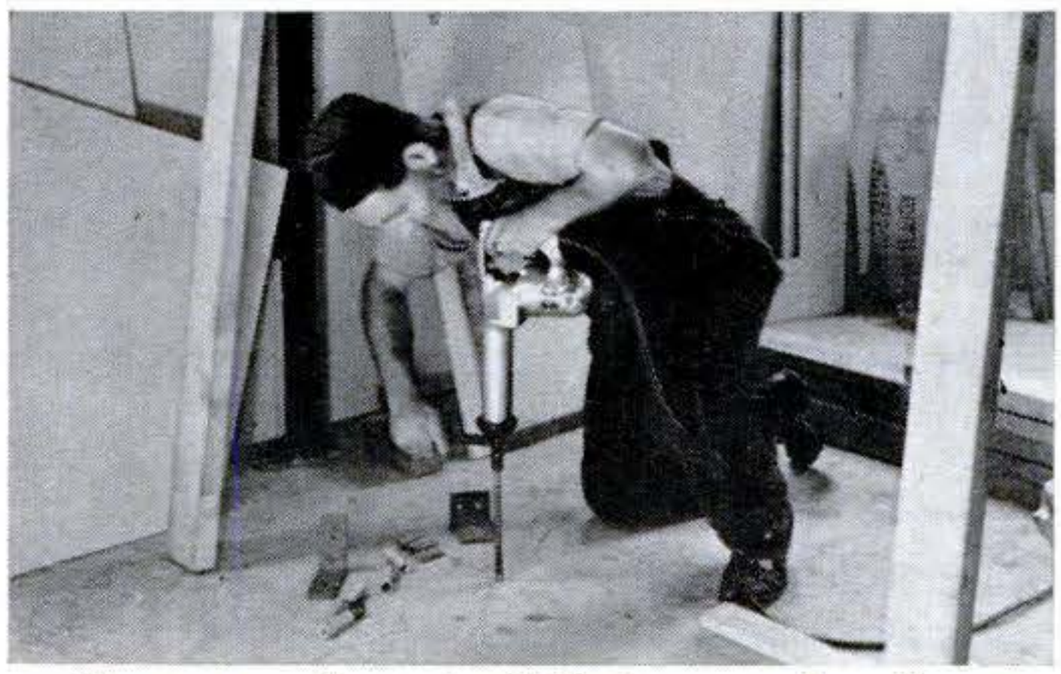
COMPLETED, POWER TOOLS HAVE JOBS TO DO

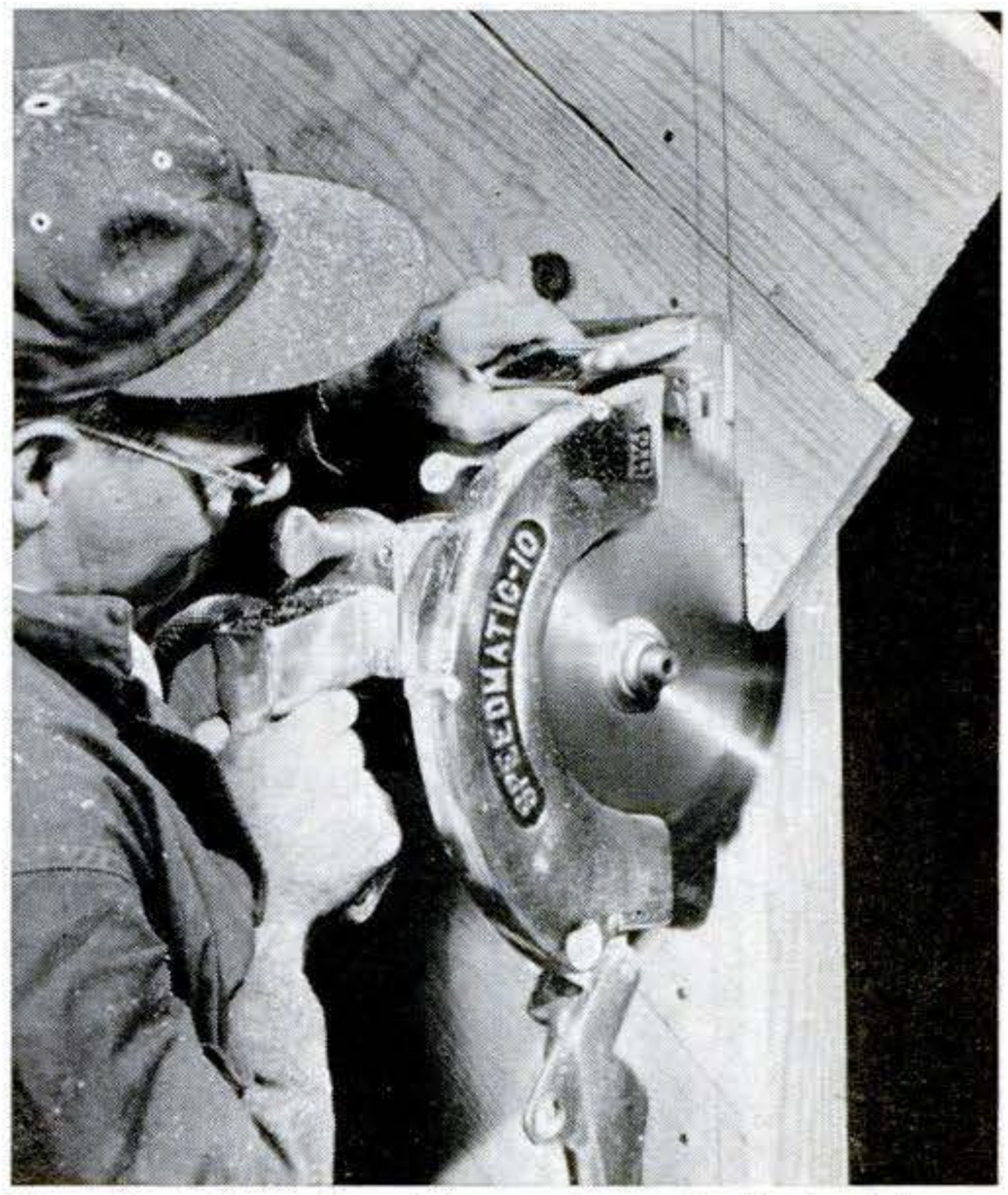
Windows are planed down to fit by Mall electric plane. Doors are similarly planed.



Plaster is smoothed by oscillating sander. It also works on curved or overhead surfaces.



Concrete floor is drilled to anchor furring by Black & Decker electric hammer (3,600 blows a minute). Hammer drills brick walls.



Random-length siding is nailed in place, trimmed like this by portable electric saw. So is random roof sheathing or subflooring.

saws, drills and concrete vibrators, and 110-volt DC for night lighting and for other drills, saws and electric hammers.

This generator is air-cooled—it can't freeze up—and it is sealed against rain, snow or dust. It weighs 129 pounds.

From site to roof, portable power is at work. One contractor keeps four sizes of bulldozers on hand to clear and grade sites. Twelve-inch trees that it would take 12 hours to remove with handsaws are cut in 4½ hours with a chainsaw.

Foundations, footings and trenches for utilities are dug on many jobs by a combina-

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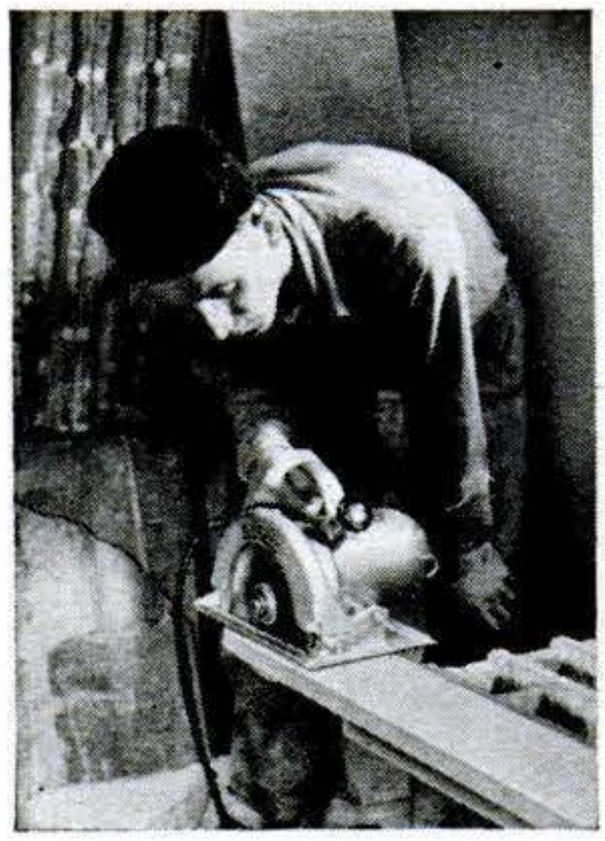
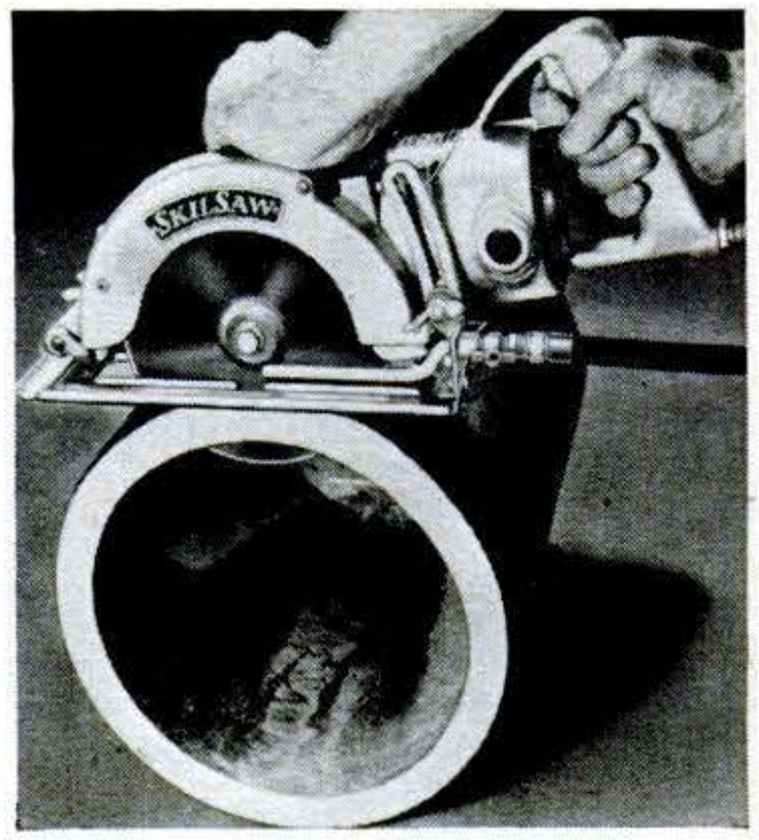
SAWS CUT MUCH MORE THAN WOOD

EQUIPPED with proper blade or abrasive disk and water cooling where needed, portable saws cut almost anything—metal, stone, glass, tile, clay products, wallboard. Simple adjustment on most models tilts the blade to cut miters, notches in roof rafters, and other angles. These saws come in range of sizes, and are probably the most widely used of the power building tools.



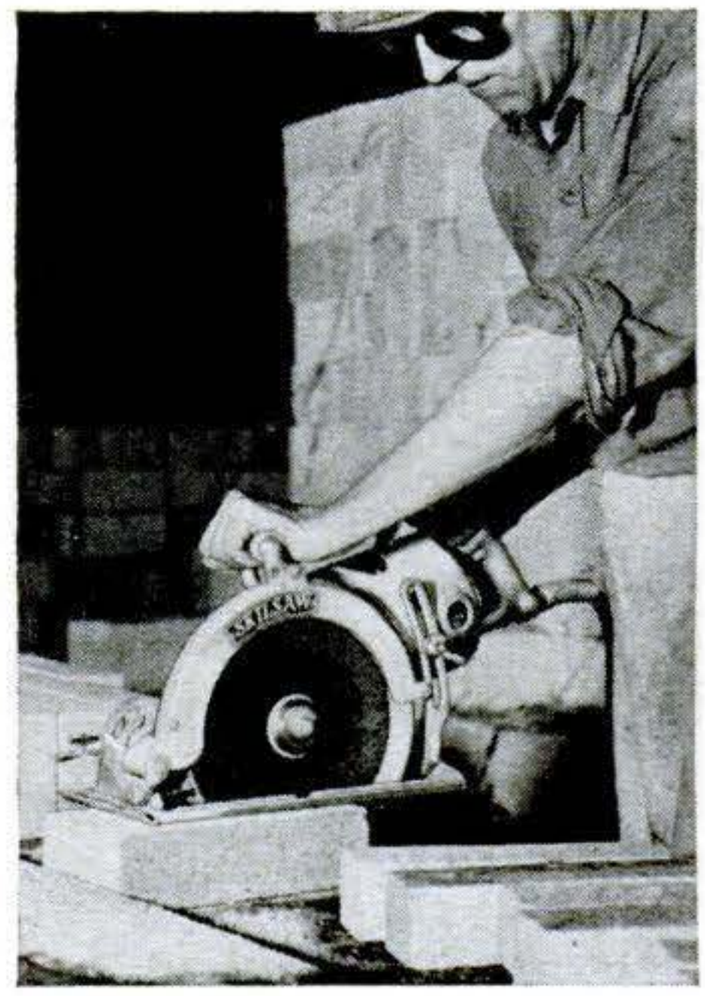
MARBLE



SEWER PIPE

CONCRETE BLOCK

INSULATION



BRICK

tion trencher and front-end loader, a truck-size digging machine. An electric pump keeps excavations dry, or pumps out holes before concrete is poured. Postholes are dug by a two-man gasoline-driven auger. A one-man gasoline hammer, so powerful it goes through frozen ground, digs holes and trenches, too. Yet it weighs only 100 pounds and fits into the trunk of an automobile.

A powerful pusher shoves pipes straight through the earth so the streets and walks needn't be torn up and traffic is not disrupted. It handles gas, water or sewer pipe from 1¼ inches to four inches in diameter. It does this with hydraulic pressures of 6,500 to 40,000 pounds.

Concrete for foundations, floors, driveways, steps and walks is trucked to housing sites ready-mixed in revolving drums to keep the concrete from hardening en route. After the concrete has been poured into place, it may be vibrated—to make it denser, stronger and more waterproof—either by concrete vibrators or by electric hammers. Some contractors use a Syntron vibrator to strengthen load-bearing edges of their floor slabs.

When it comes to cutting the frame, a radial saw can handle the whole job. Joists, studs, beams and rafters may be cut on the site or in a shop by a 16-inch radial saw. Versatile, tough, accurate, powerful (three to five horsepower), it can cut through eight two-inch pieces at the same time.

Stair stringers, corner bracing, and rafters

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are notched by the radial or the portable electric saw.

As a house goes up nowadays, you may seldom see a carpenter without his power-operated right arm, the one with the whirling, whining saw blade. The portable electric saw is just about the handiest of the power tools—on many home-building jobs each carpenter is allotted one. Like a handsaw, it is easily carried wherever there is something to cut. But unlike a handsaw, it changes blades to suit the job, and it gnaws right into paneling or subflooring without a starting hole.

The portable saw is fast. In one test it ripped through 10 feet of 1¾-inch fir in 30 seconds. A man with a handsaw cut only one foot in the same time.

And it is light enough so that overhead cuts and day-long sawing don't call for a steelworker's physique. The smallest saw (six-inch) weighs only 9½ pounds, the popular eight-inch model around 20. A new 8¼-incher is so powerful it slices through the heaviest loads without slowing up.

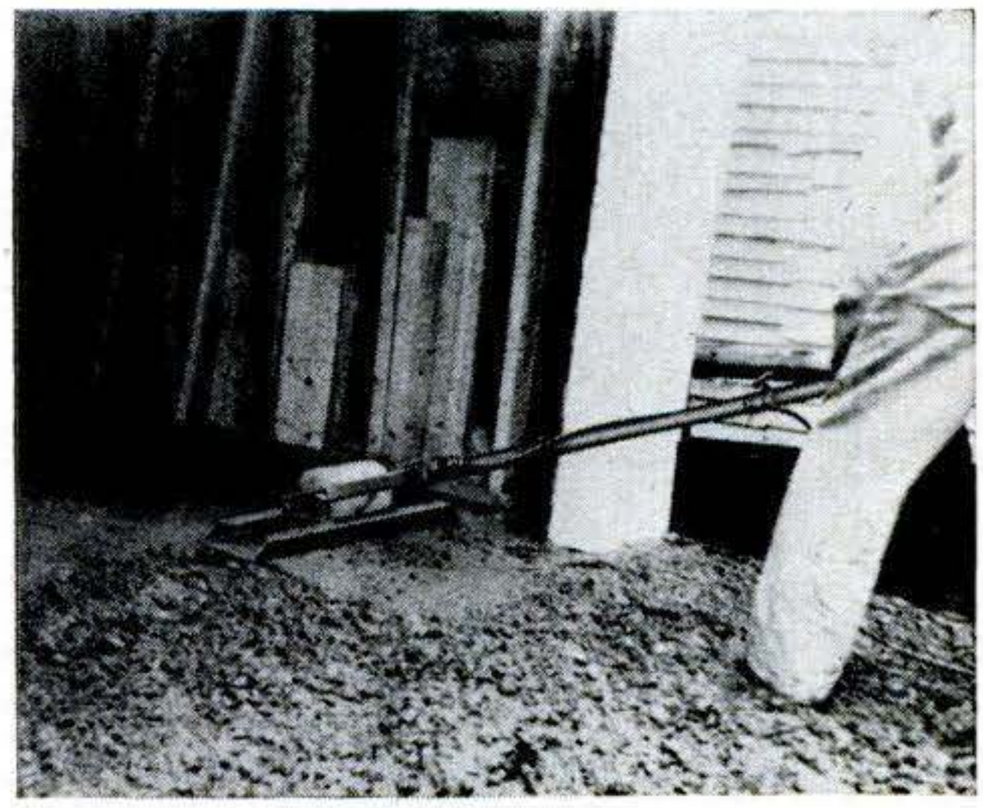
One of the most unusual of the new tools is the automatic hammer. This is a pneumatic device that can drive 100 nails a minute into subflooring or roof sheathing. The carpenter just stands on the board, raises the handle, presses the trigger—and goes on to the next board.

Through the growing house, other tools speed the work. For bending pipe—a big job when radiant heating is going in—you

[Continued on page 248]

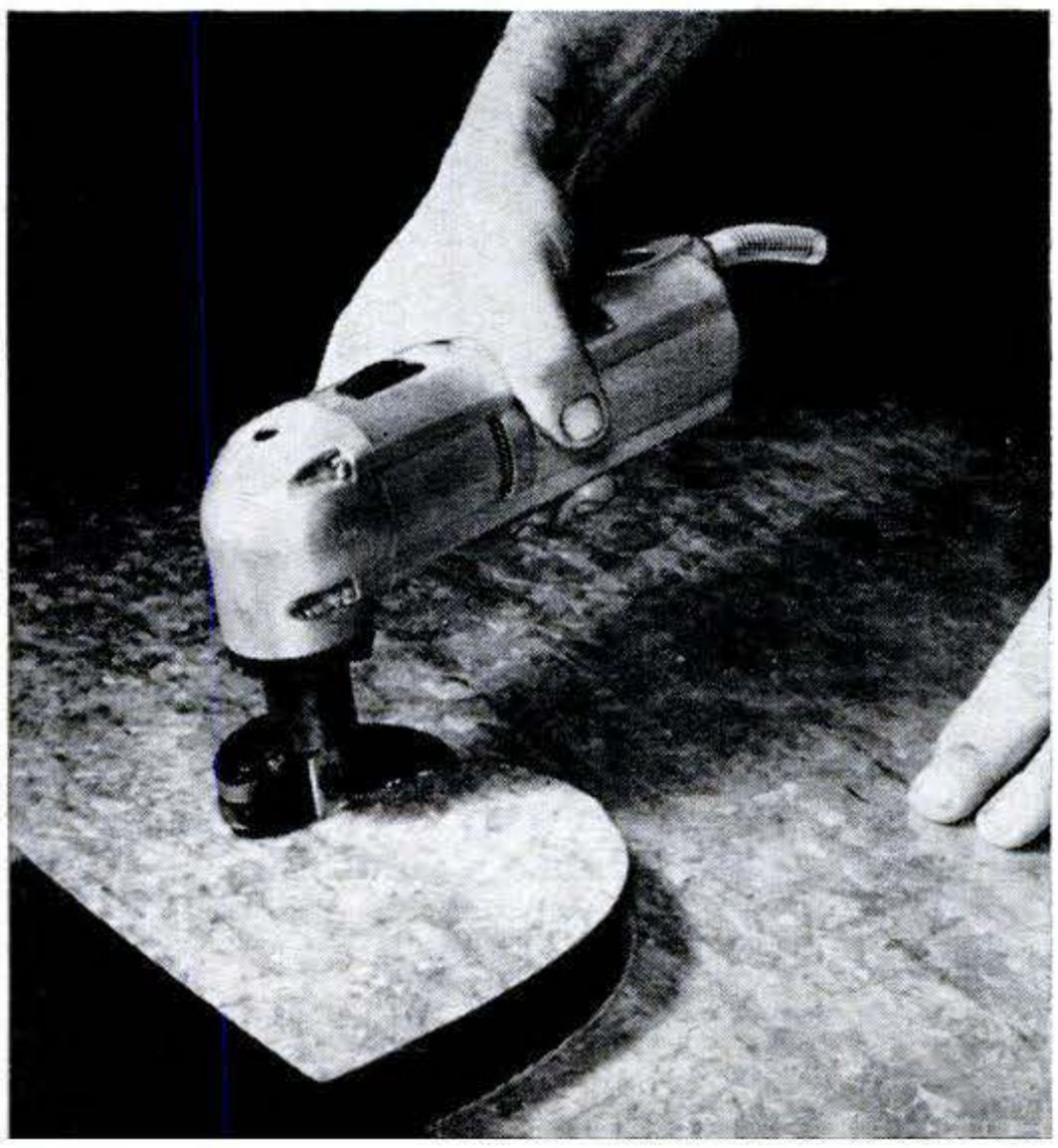
THESE TOOLS ARE BECOMING MORE COMMON

Pipe bender shapes cold pipe. By pumping handle, a man can develop hydraulic power to make bends. Or motor can power bender.



Vibrating float surfaces concrete five times as fast as by hand, makes load-bearing edges of house slab stronger.

Electric shear cuts sheet metals—aluminum, copper, steel. It cuts gutterwork (here), flashing and heating ducts.



Power hammer digs postholes, breaks rock, digs clay and shale and tamps backfill. It is driven by gasoline motor.

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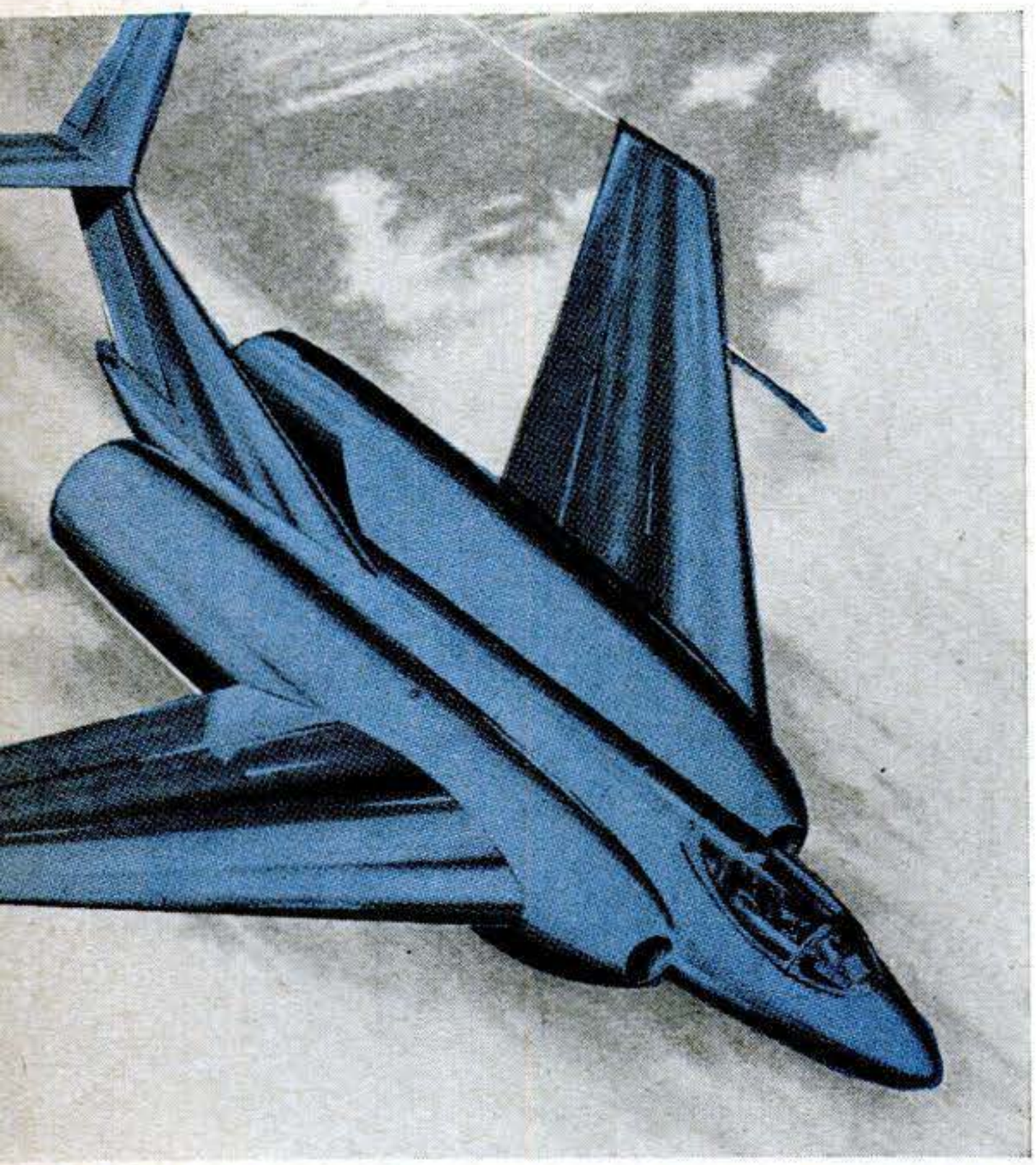
Is Russia Building These Speedsters?



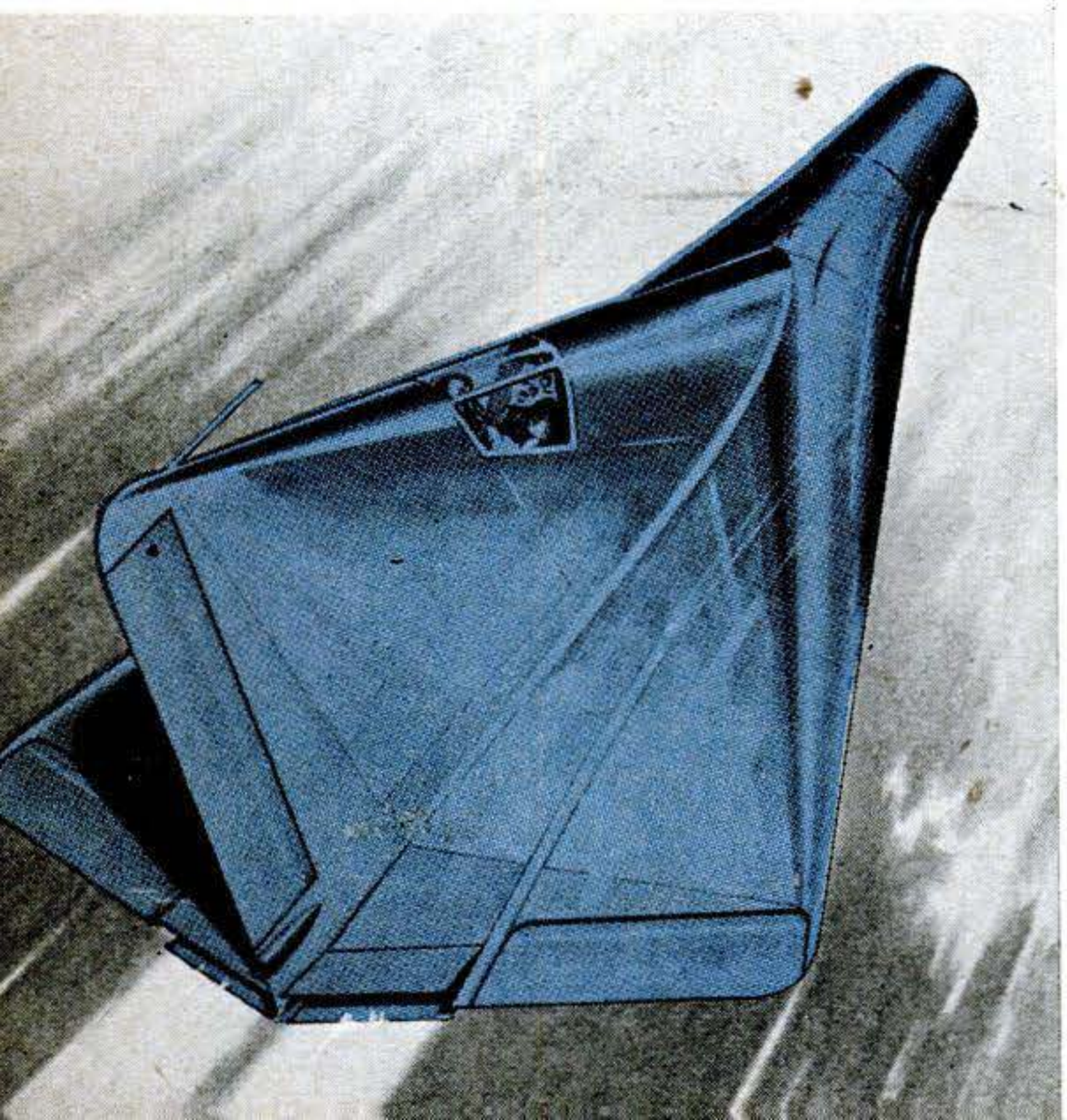
By Chalmers ("Slick") Goodlin

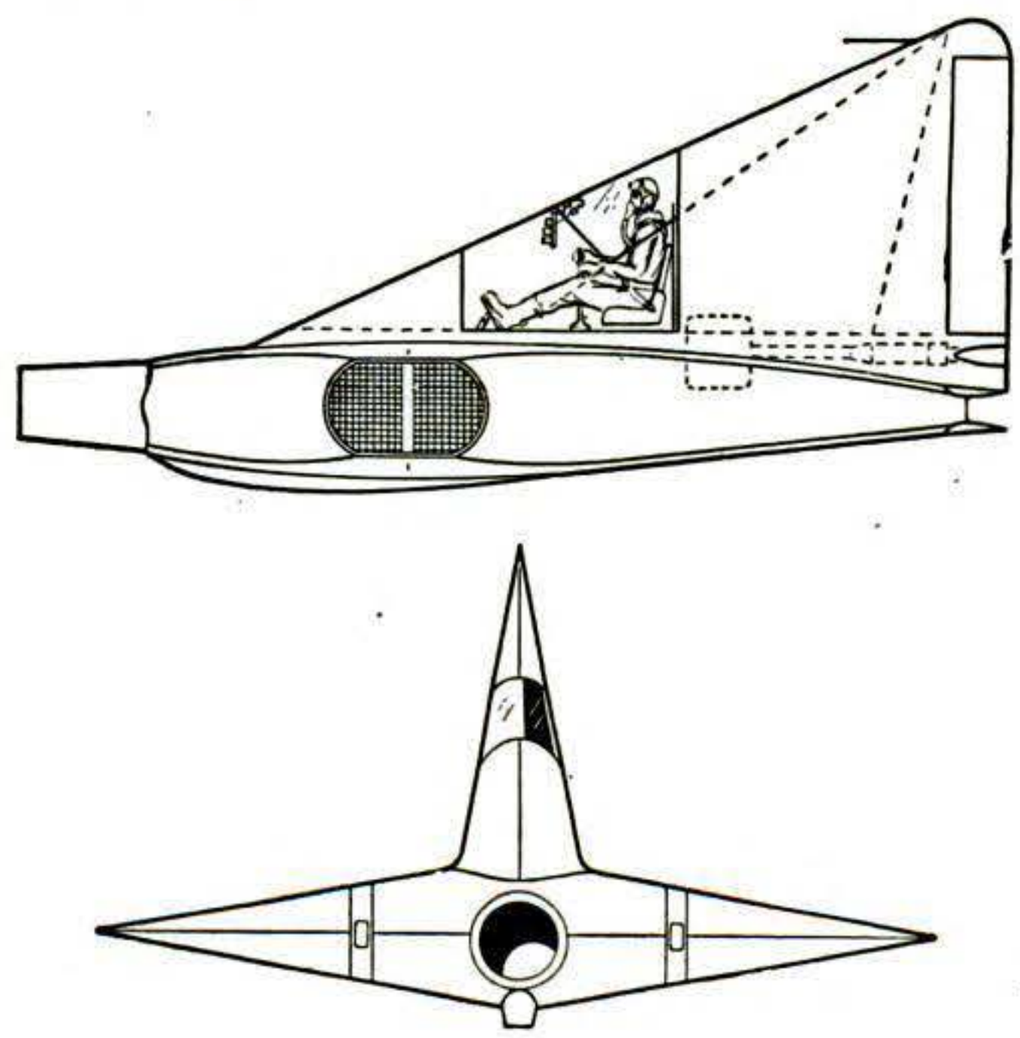
AT THE end of World War II, the Russians rounded up some 80 percent of the Nazi aircraft industry and moved its brains, experience and factories behind the Iron Curtain. A juicy prize, for it is well known that the Germans had designs for jets and rockets far in advance of any U. S. development at the time.

"Has the Soviet exploited this advantage?" I asked a private source in Europe that has proved reliable in the past. In reply, I received these three drawings, published here for the first time, of planes designed for *sustained* supersonic flight.

The Russians may have added a T-tail to the Heinkel P-1080. In the design shown above, the twin ramjet engines, about 16 feet long and three feet in diameter at the combustion chamber, are bigger than the fuselage. And the entire fuselage, behind the nose-tip cockpit, is probably a huge fuel tank. Although no rocket-assisted take-off device is evident, some RATO scheme must be provided for ramjets. Retractable landing skids may be another feature. Progress on this design is not known, but considerable work is reported.

A flying wedge like one below is reported to be on the Russian drawing boards. As radical as its design is the ramjet power plant—reportedly able to push the wedge to double the speed of sound. Indications are that it can burn powdered *coal*—a steal from the oil-starved Luftwaffe. The cockpit shown is a 65-degree-sweep fin. Wing has a 60-degree sweep, with a split jet exhaust in the tail. It is believed the Soviet has a 6,600-pound-thrust rocket that can get the plane to the speed at which its ramjet engine will operate.





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Engines in the tail are a futuristic feature reported in this possible Soviet development of Kurt Tank's Ta-283 Focke-Wulf design. From information available to him, the artist has drawn details of tail-mounted ramjets with a rocket engine in the fuselage. With a wing sweep of 45 degrees, this design is rumored to have a span of about 26 feet and length of almost 39 feet. Fuel tanks are just forward and aft of cockpit, which fairs into tail fin. Rocket engine could be used for take-off, for acceleration to ramjet speed and for bursts of combat speed.

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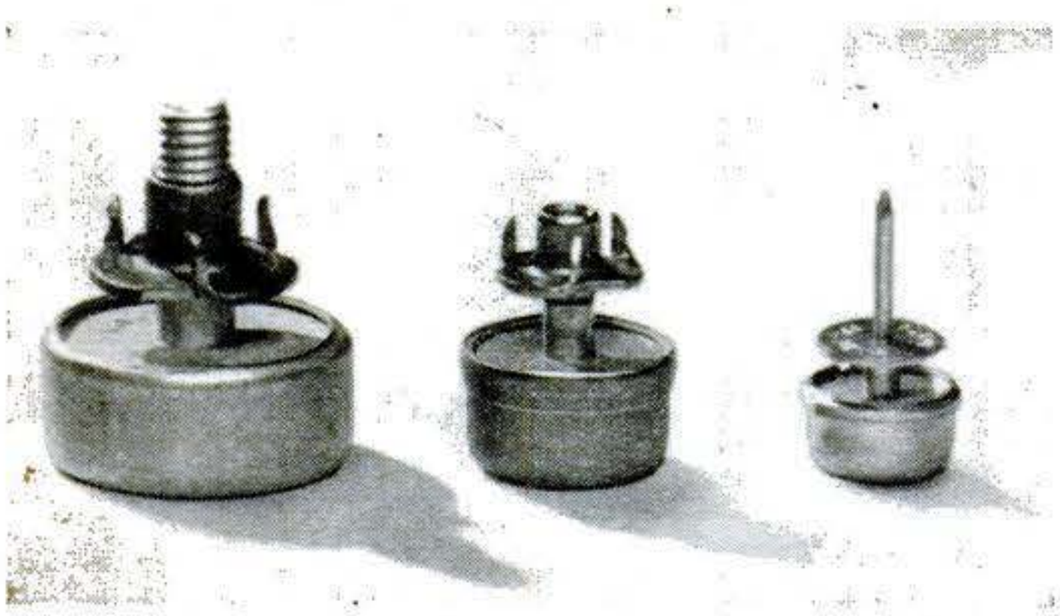
Aids to Modern Living

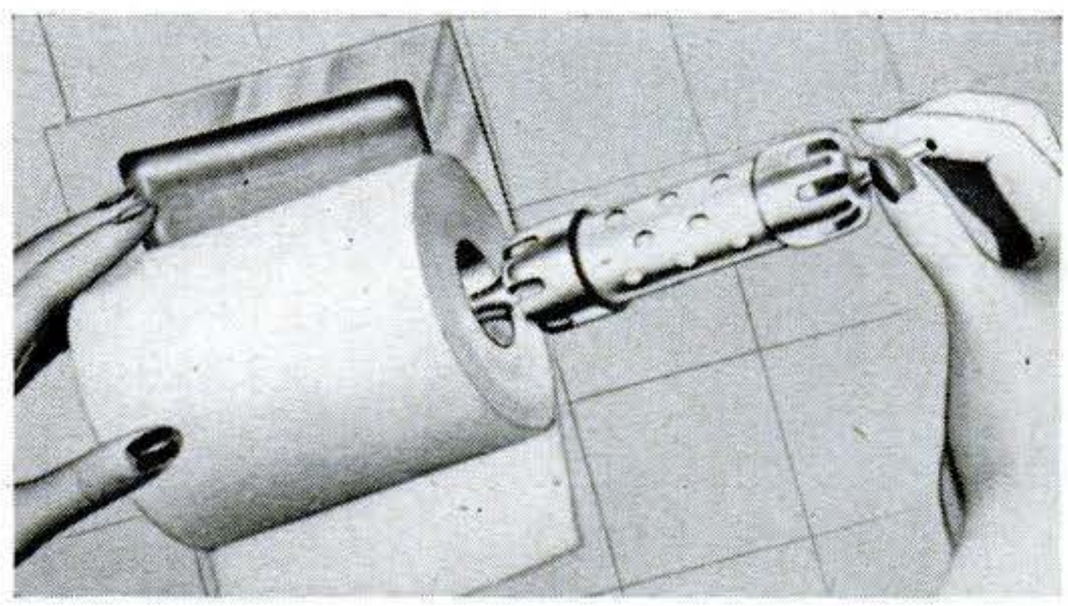
Traveling Crib. Baby takes a safe nap in train, plane or car on this inflatable cushion. Air-bolstered sides keep the baby from rolling off and retainer straps add extra security when needed. It will also hold him in place while he wriggles through his sponge bath. *Kaydon Mfg. Co., Santa Monica, Calif.*

Gas Stove Has Electric Pilot. There's no gas pilot light on this Norge stove. An electric glow coil does the igniting. You simply press a button and then turn on the gas. There's also an oven-lighting coil.

Six Measures in One. Adjusting the lever on the handle moves the bottom of this plastic cup up or down to change its capacity. Settings range from a whole cup to quarter-cup. *Miles Kimball Co., Oshkosh, Wis.*



Automatic Furniture Levelers. Filled with silicone compound, these glides for furniture legs adjust themselves hydrostatically to compensate for uneven floors. *M. K. Furman Co., New York City*



Air Freshener. This deodorizer hides away inside the toilet tissue in place of the usual roller. The chromium-plated dispenser contains a replaceable chlorophyll cartridge. *Walter Thomas, Los Angeles.*

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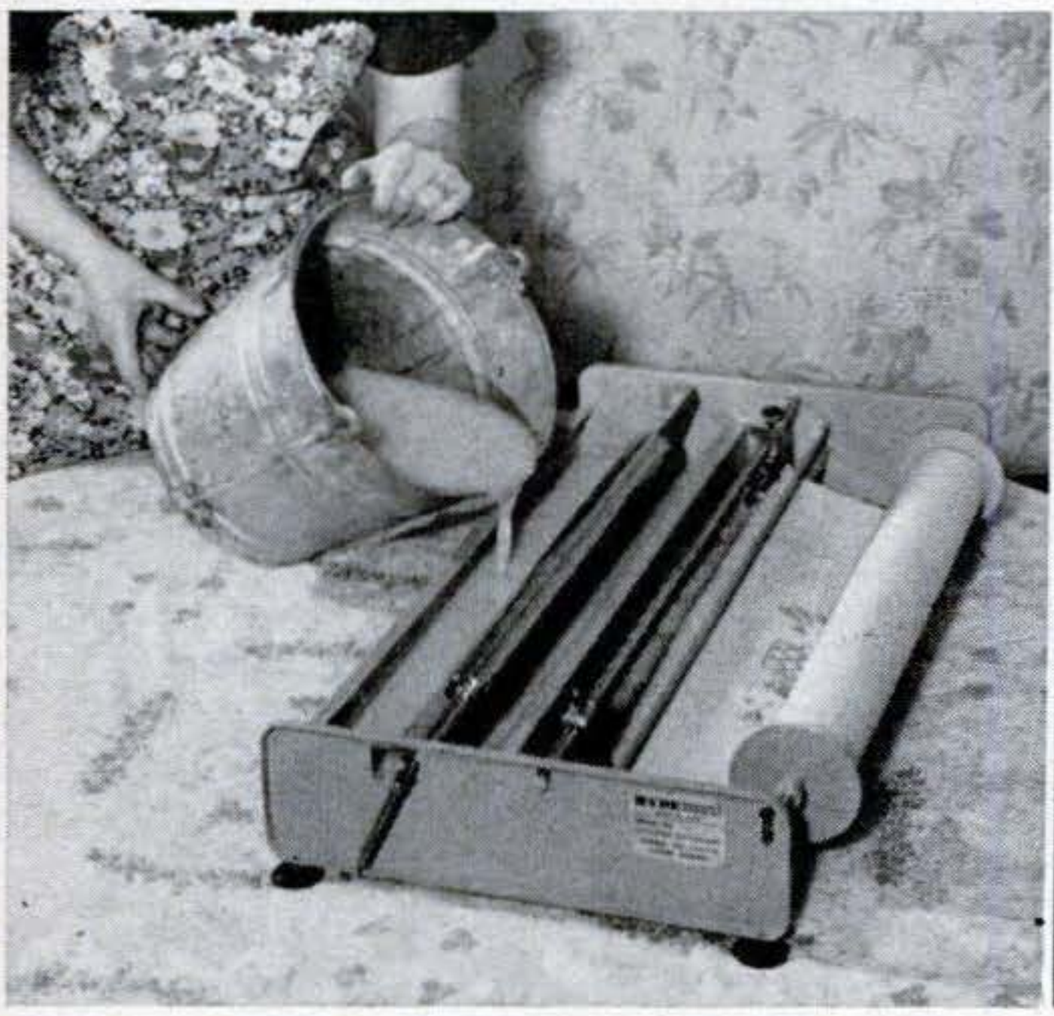
Shoestring-Potato Cutter. Fit a paring knife into this tool, crosswise to the six little built-in blades, and it will cut the potato into narrow strips. *Art Metal Appliance Co., Hollywood, Calif.*

Refreshment Server. If a snack plate and coaster are combined this way, you can reach for the hors d'oeuvres and the glass won't skid off your plate into your lap. *Alexander & Wilson Co., Pasadena, Calif.*



Wallpapering Machine. With this equipment you can trim and paste wallpaper in one operation. Paper roll is inserted on spindle, and fed through cutters and past pasting roller. Plumb line sets length. *Hyde Mfg. Co., Southbridge, Mass.* $55.

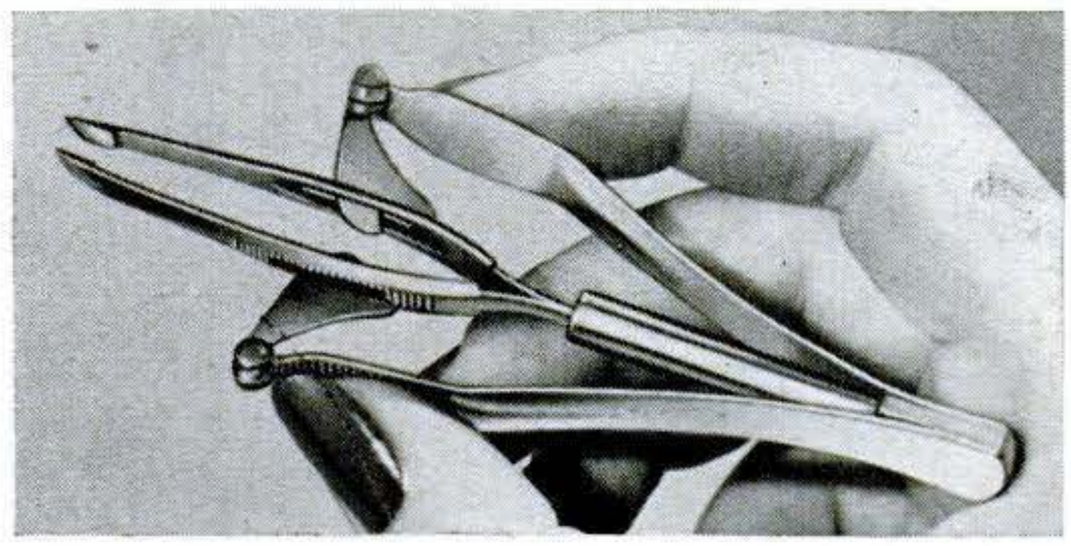
Ottoman-Chair for TV. Lift and fold back the top of the ottoman below and it becomes a chair. As the top is raised, the rear legs disappear into the frame, tilting the chair for comfortable televiewing. *Holland House Mfg. Co., Chicago.*

MORE Aids to Modern Living

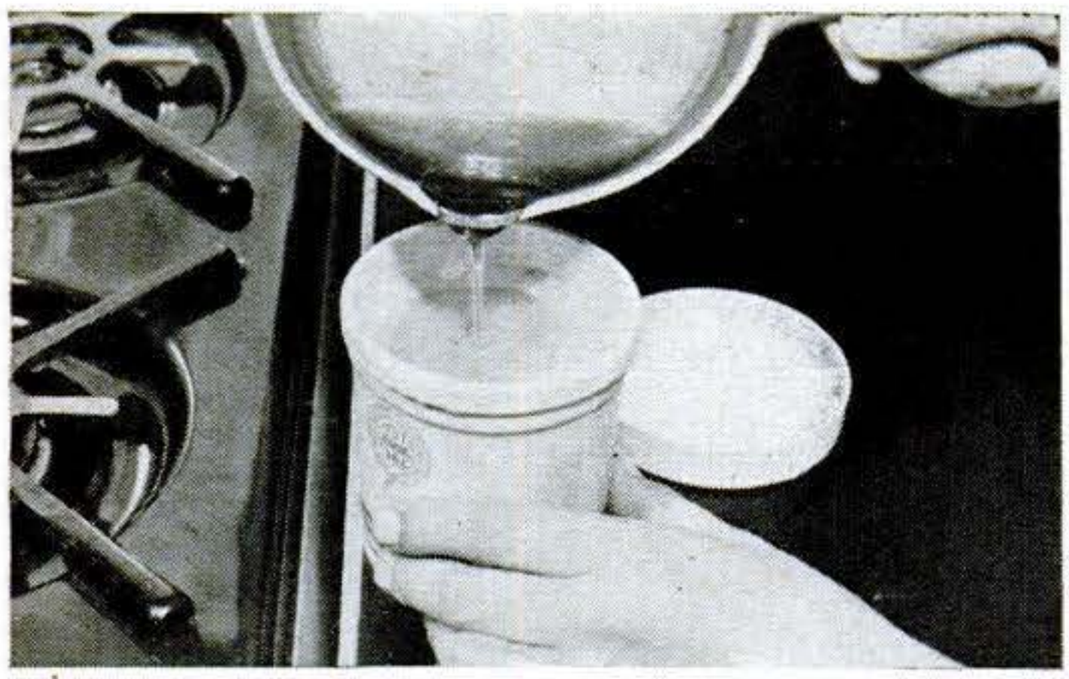
Hot Picture. An invisible electric heating element built into the surface of this picture makes it a small room heater. Maximum temperature of the surface is under 200°F. *Electrofilm Corp., N. Hollywood, Calif.*

Venetian-Blind Control. Fasten two self-locking clips to the tapes and cords and you can close your blinds at the bottom and keep them open at the top. They work in reverse also. *Kuto Co., New Hyde Park, N.Y.*

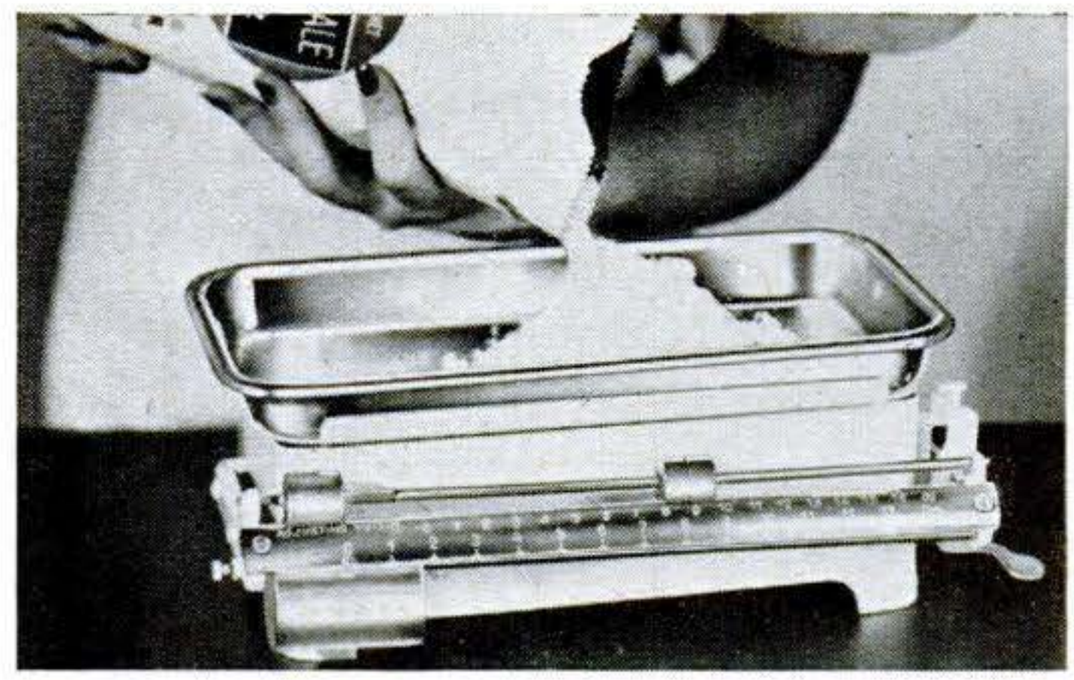
Luminous Dial. The two plastic halves of this glowing dial face lock in place on telephone and give sufficient illumination for dialing in the dark. *The Glo-Dile Co., Burbank, Calif.*



Painless Tweezers. Eyebrow-plucking is hardly felt with these tweezers. Pressing the sidepieces snaps blades back into a sleeve, so that hair is grasped and drawn out in one operation. *D. Corrado, Inc., Chicago.*



Paper Container Is Rugged. This plastic-coated container will store any food, even hot bacon fat, without leakage or absorption. It's for use in refrigerator or freezer. *Sealright Co., Inc., Fulton, N.Y.*



Kitchen Scale. A range of ¼ oz. to 14 lb. is covered by this springless scale and its balance weights. The imported $16.95 scale is finished in enamel, has a removable chrome tray. *Hoffritz, New York City.*

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He Shoots Houses Out of a Gun

This nozzleman can build the walls and roof of a two-bedroom house in a working week, shooting cement and water against steel forms.

THE man looming above is spraying a mixture of sand, cement and water under 40 pounds' pressure. He is building a house that when finished will look like the house of Mrs. Pauline Vogel, of Apple Valley Vista, Calif., shown in the inset above.

A man with a gun shot Mrs. Vogel's house in 40 working hours: the whole job took five weeks. And it cost about $8.50 a square foot, considerably less than conventional wood construction. The only parts of the structure made of wood are doors and cupboards.

It takes a bag of tricks to put up long-lasting houses at that price. First, steel forms with a single "backdrop" wall are erected in sections on a regular concrete foundation and floor slab. These forms outline the outside of the house. A network of steel reinforcing bars is tied together along the inner side of the form. Plumbing and electrical conduits are tied into the bars.

The mix—cement and sand—is blown dry

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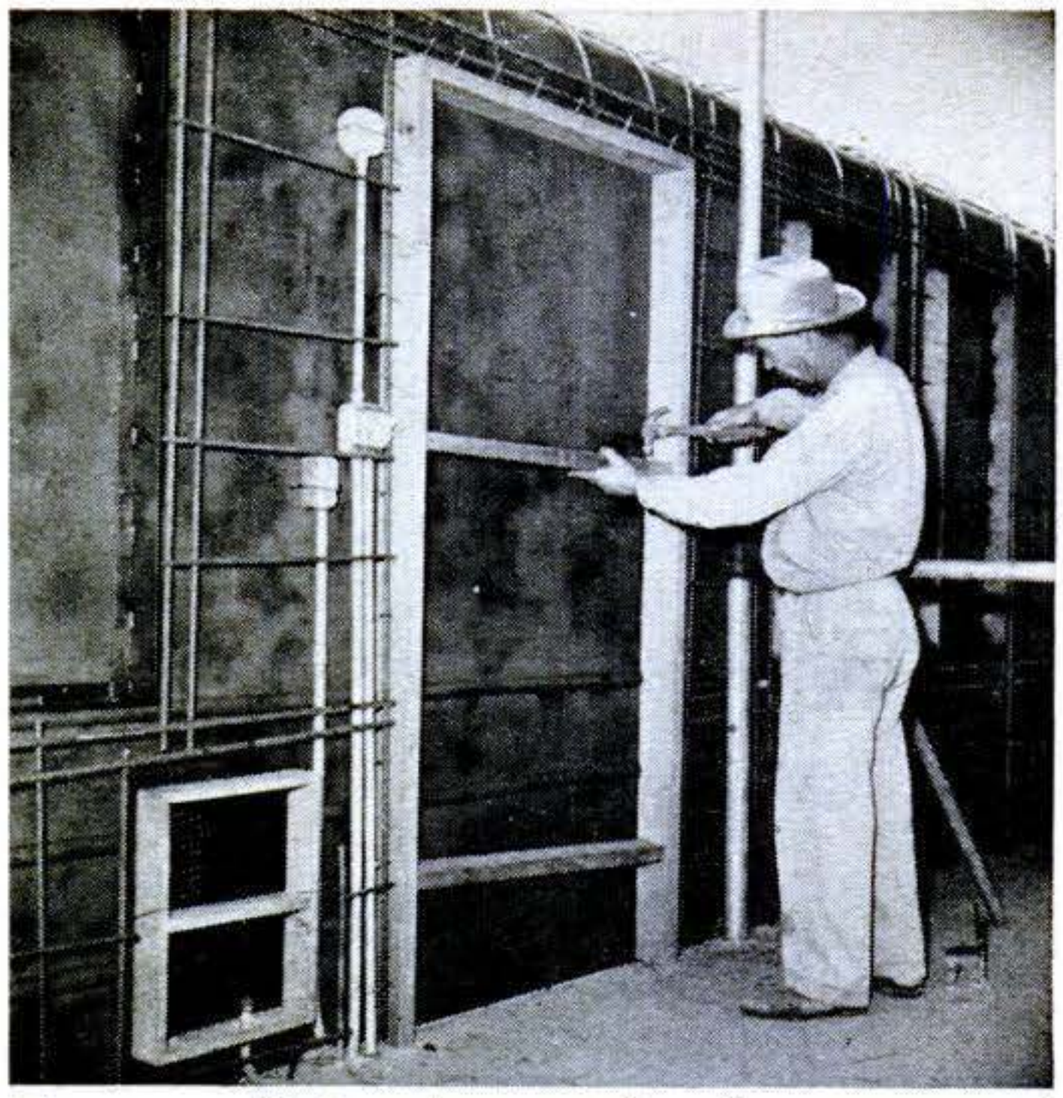
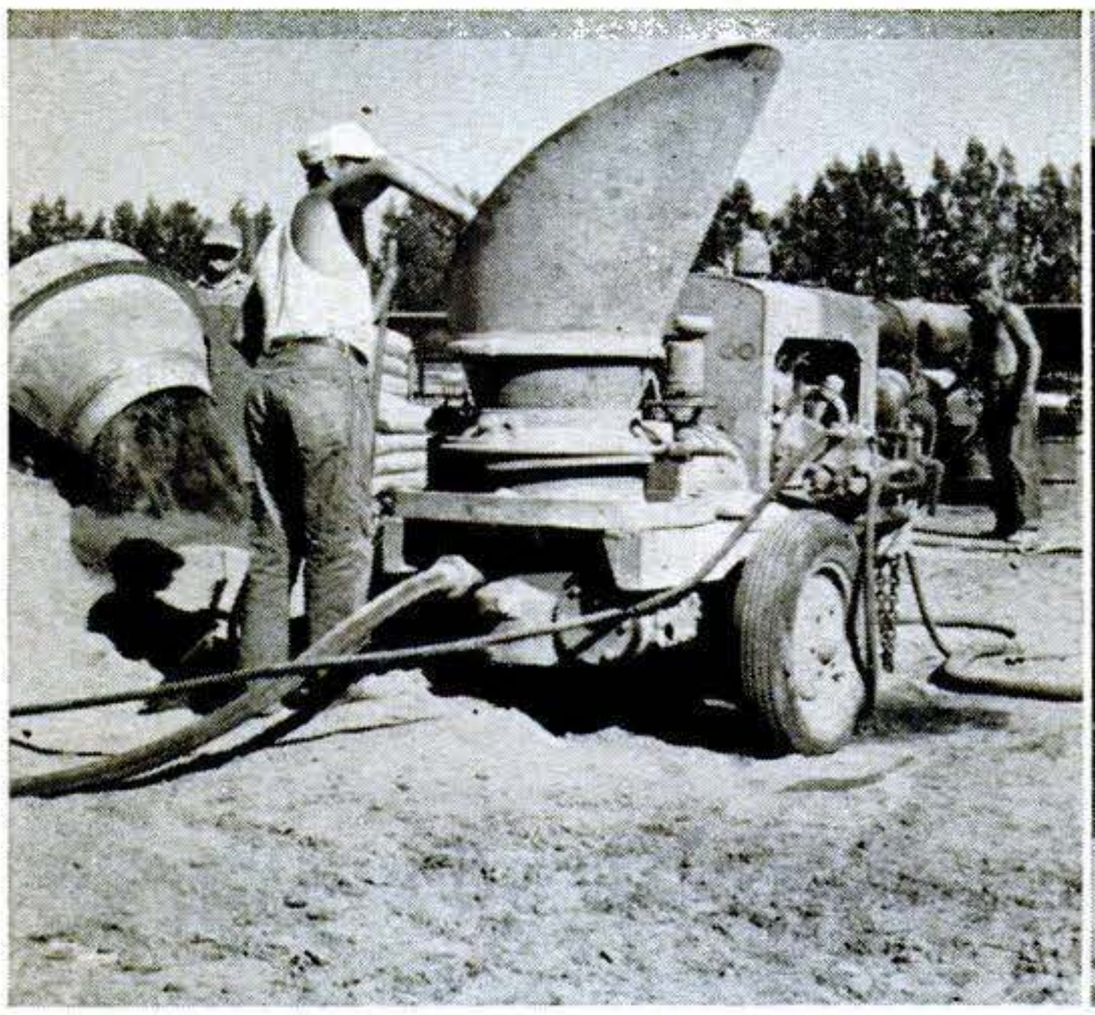
through a pipe to the nozzle, where the nozzleman controls its mixture with water fed through a hose. When the pressure climbs to 40 pounds, the nozzleman starts shooting cement against the open, inner face of the form. Reinforcement, pipes and conduits are all engulfed as he builds up a vertical six-inch layer of concrete—the wall.

The walls separating the rooms are half as thick and made in the same way, while the roof is blown on from above against steel forms. The forms are pulled out after two or three days when the concrete has set hard. The exterior walls are then waterproofed.

The homes shot out of a gun are being developed by Conair Sales, Inc., of North Hollywood, Calif. The sectional steel arch and wall forms were perfected by William Bobisch, veteran structural engineer, and L. E. Town, a professional builder. They say their houses are insectproof, fireproof and virtually earthquake-proof. END



Frame outlining door is placed against metal wall form: nozzleman will shoot around it. Steel-bar reinforcement, electric conduits, pipes, are in place, will be embedded in wall.



Cement-sand mixture, being dumped on ground by mixer in background, is shoveled into screened hopper. Air compressor will blow it through pipe, foreground, to nozzle.

Nozzleman sprays inside wall form in horizontal strips, starting at the floor. Dry mix arrives in large pipe, water in hose. Ingredients are combined in nozzle into stiff mixture to avoid sagging.

Dome-shaped roof form is put together from numbered steel panels that are supported on steel poles, like one in foreground. Forms will be removed after cement hardens.

Nozzleman shoots the roof from above while helper handles mixture and water lines. Later two coats of rubber-base sealer, the last one colored, will be sprayed on.

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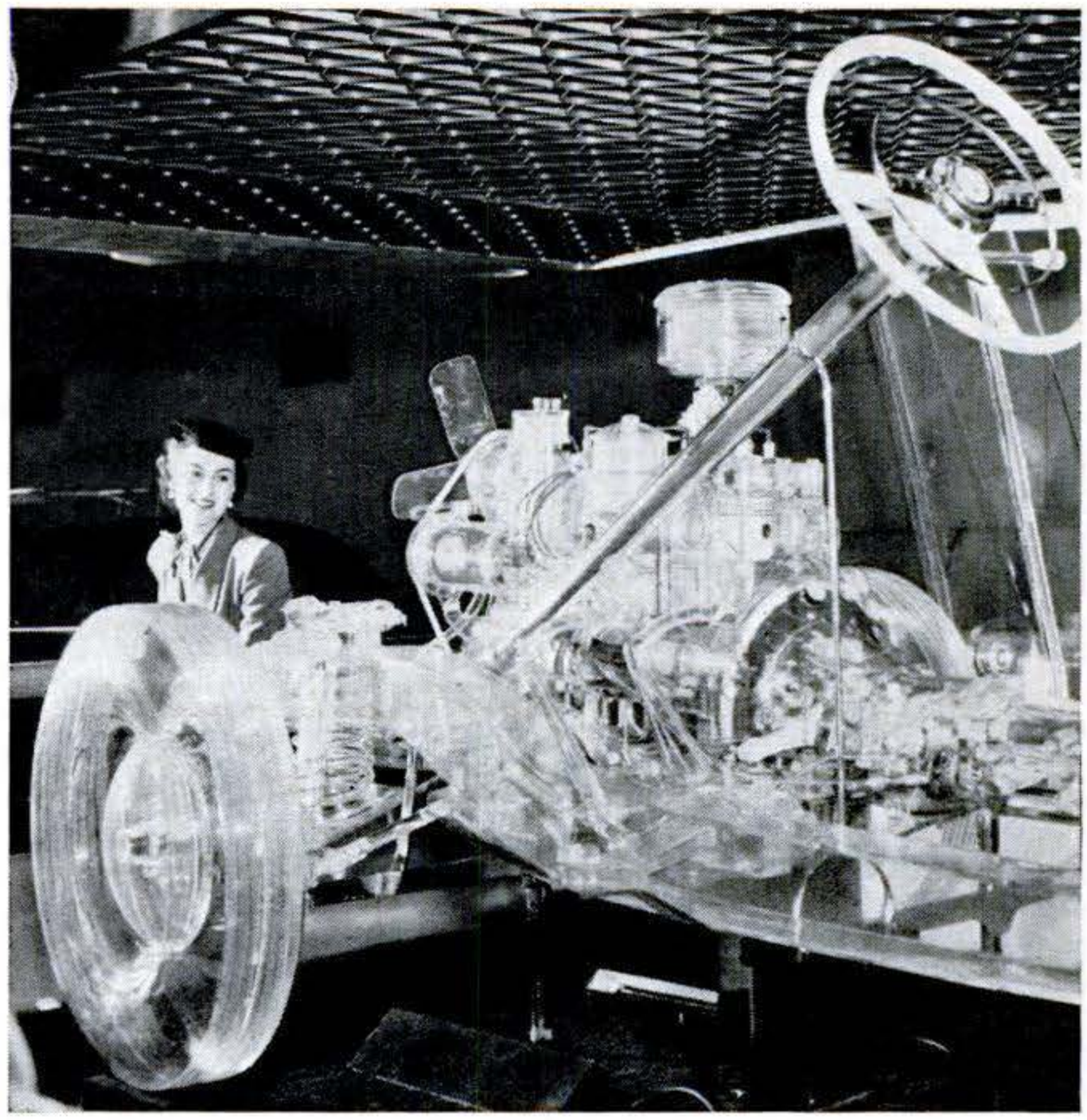
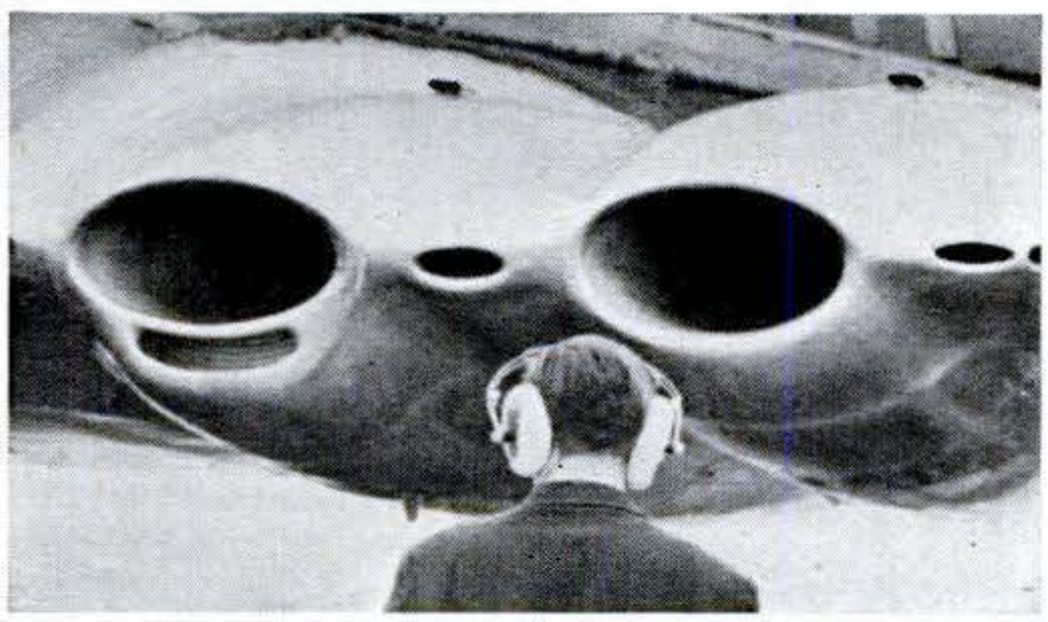
You Can See Through This Plastic Car

THIS full-scale model of a Plymouth, with engine, chassis and wheels of transparent plastic tells the inside story of how an automobile functions. Its largest unit, the engine, has a cylinder block machined from a chunk of plastic 12 by 12 by 24 inches. And it works—by means of a chain drive from a concealed electric motor. Parts of the power train are colored distinctively to help spectators follow the flow of power from combustion chambers to wheels as the engine turns over at a lazy six r.p.m. Some 1,200 separate plastic parts had to be made for the display model. Building it took a year and a half.





Ear Muffs Deaden Jet Roar

EAR muffs—for quiet, not warmth—may become a common sight at airports when roaring jet liners go into commercial service. A British ground crewman models a pair at left as he faces the jet air intakes of a de Havilland Comet (it's okay, the engines are off). This plane is expected to begin regular flights on the London-Cairo route soon.

Caged Tractor Protects Golf-Ball Retriever

SAFE inside a wire cage, this man sweeps up golf balls on a practice-driving range the easy way. He tows a machine, shown in closer view at right below, that can gather up to 1,200 balls in 15 minutes. The balls are squeezed between a series of rotating fiber disks, stripped loose by mechanical fingers and deposited in catch bins. Felix Kropp had the machine designed so that he wouldn't have to shut down his driving range in Madison, Wis., every time balls have to be picked up. It sweeps up more than 90 percent of the balls it passes over. When the small tractor is not busy at its ball-retrieving job, it pulls a lawn mower.

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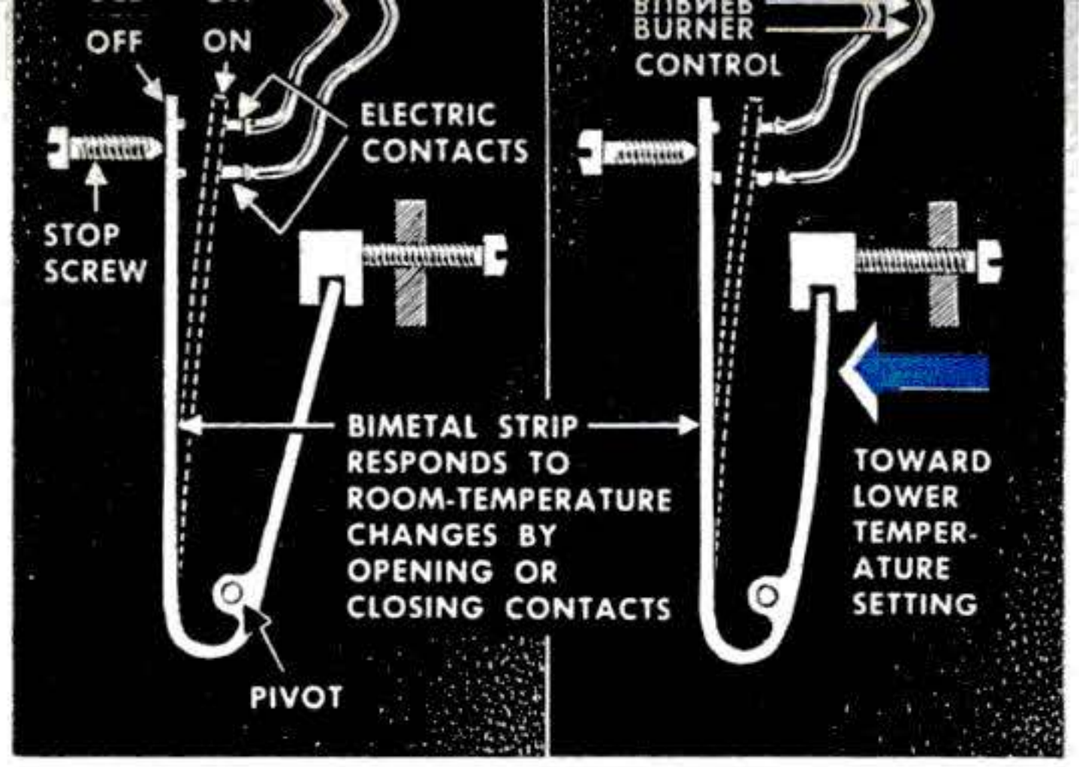
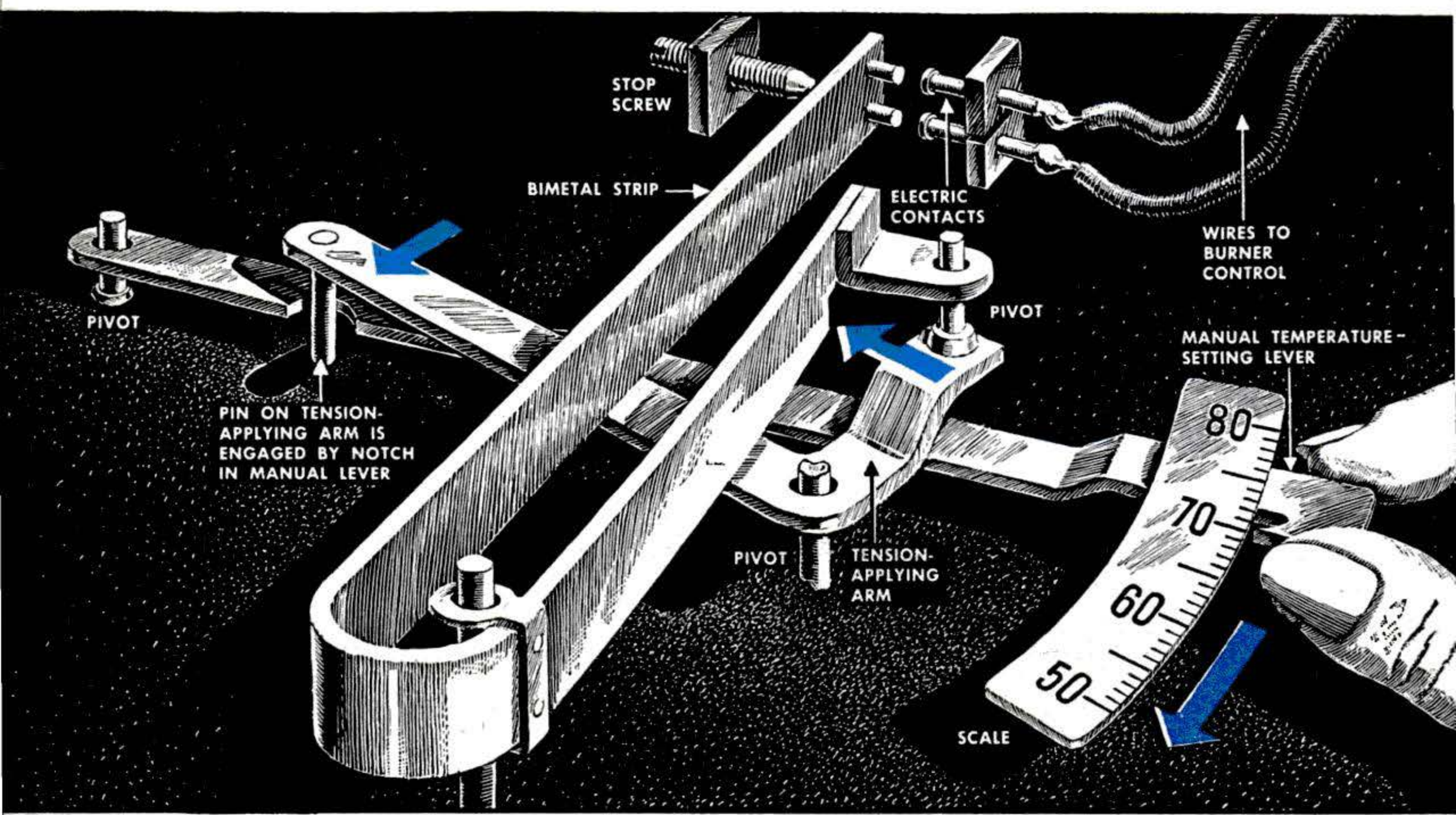
How a Thermostat Tends Your Furnace



Here is thermostat's principle. U-shaped, bimetal sensitive element turns heat on as room cools; off as room warms. Adjusting tension (right) sets it to maintain temperature wanted.



Room thermostat applies principle shown at top of page, using a little more elaborate mechanism. Here's how a hand lever adjusts the sensitive element to maintain desired room temperature. In manual operation, lever is pushed down at night and raised in the morning. In clock thermostat (facing page), this lever remains at daytime setting, and automatic timer does rest.

By Alden P. Armagnac

EARLY on a chilly morning while you sleep, a benevolent genie called a clock thermostat snaps a basement switch and turns on the heat. By the time your alarm clock goes off and you yawn and stretch, the house is comfortably warm.

This is the story of how the clock thermostat works its pleasant magic.

The little brass case on your living-room wall displays a clock dial and a miniature thermometer. The thermometer is there simply for your information, and has no connection whatever with the mechanism.

Controls of Clock Thermostat

On the outside of a typical model, other gadgets include a temperature scale and a pair of adjustable levers—two of the instrument's four preset controls. The upper lever is set to the desired daytime temperature, and the lower one to the lower temperature wanted at night.

Removing the cover reveals the two remaining controls—a pair of adjustable point-

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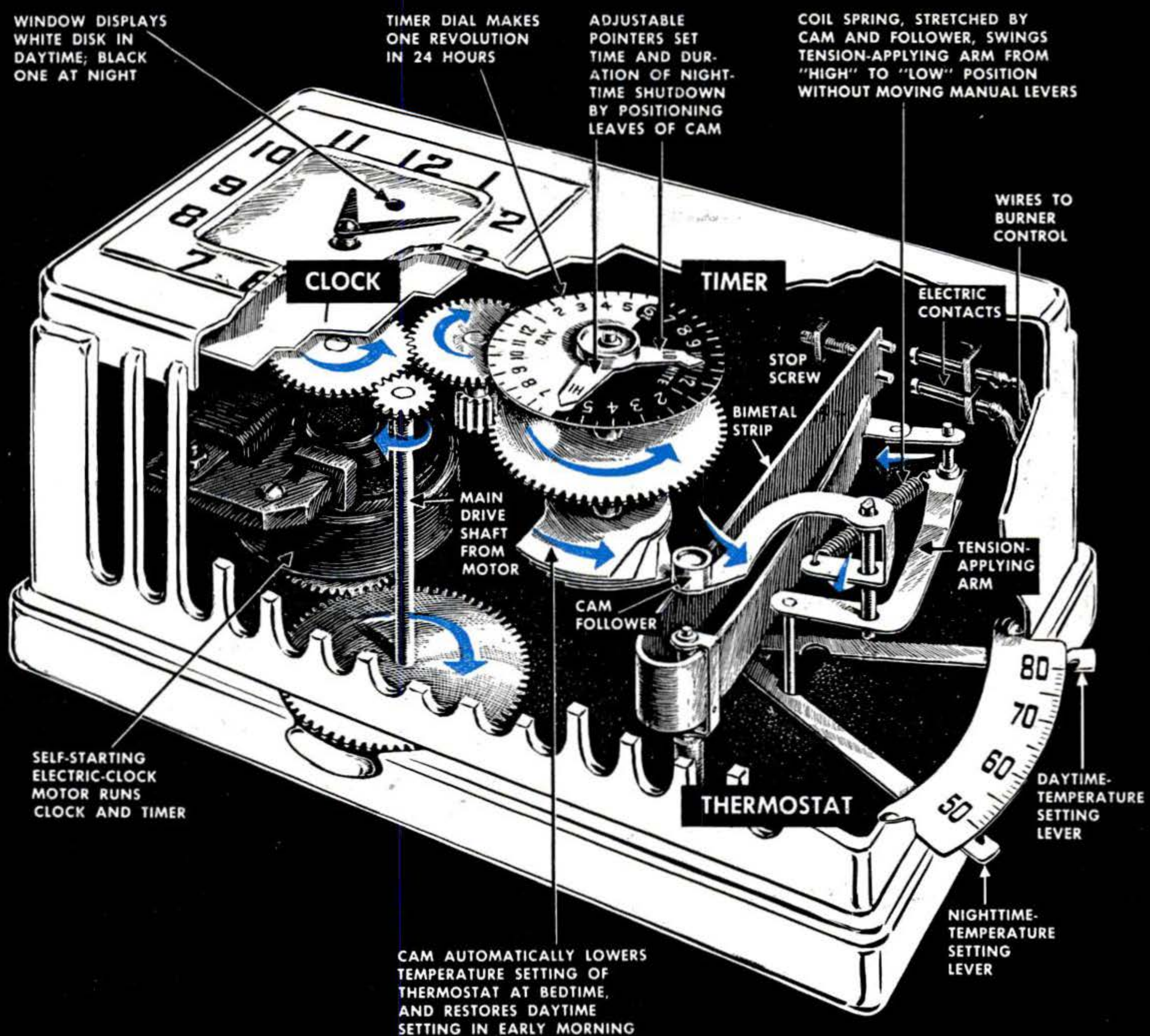

Clock thermostat automatically lowers temperature at night and raises it in morning. Simplified drawing shows how cam adjusts sensitive **element** directly. Two manual levers stay put. Upper one, preset to desired daytime temperature, works as shown on opposite page. Lower one, preset for nighttime temperature, acts simply as a stop to limit temperature drop.

ers, marked "Hi" and "Lo," on a black-and-white 24-hour dial. The "Hi" pointer is set to the hour at which you want heat to come on in the morning, the "Lo" pointer to the hour at which you want the temperature lowered at night.

The works has just three essential parts: a thermostat to control the burner, a timer to vary the thermostat setting, and a clock to drive the timer.

Heart of the thermostat is a temperature-sensitive element, a U-shaped strip made by joining layers of two different metals. Heat expands the two metals at different rates. Consequently the U-shaped strip uncurls as temperature rises, and curls up again as temperature falls. Since it is pivoted, and one end is anchored, only the free end moves.

When room temperature begins to fall, the sensitive strip's free end moves until it hits a pair of contacts and closes an electric circuit. Through wires leading to the basement, the closed circuit turns on the heat by actuating your oil burner or gas burner.

When sufficient heat has come up and room temperature is about to exceed the

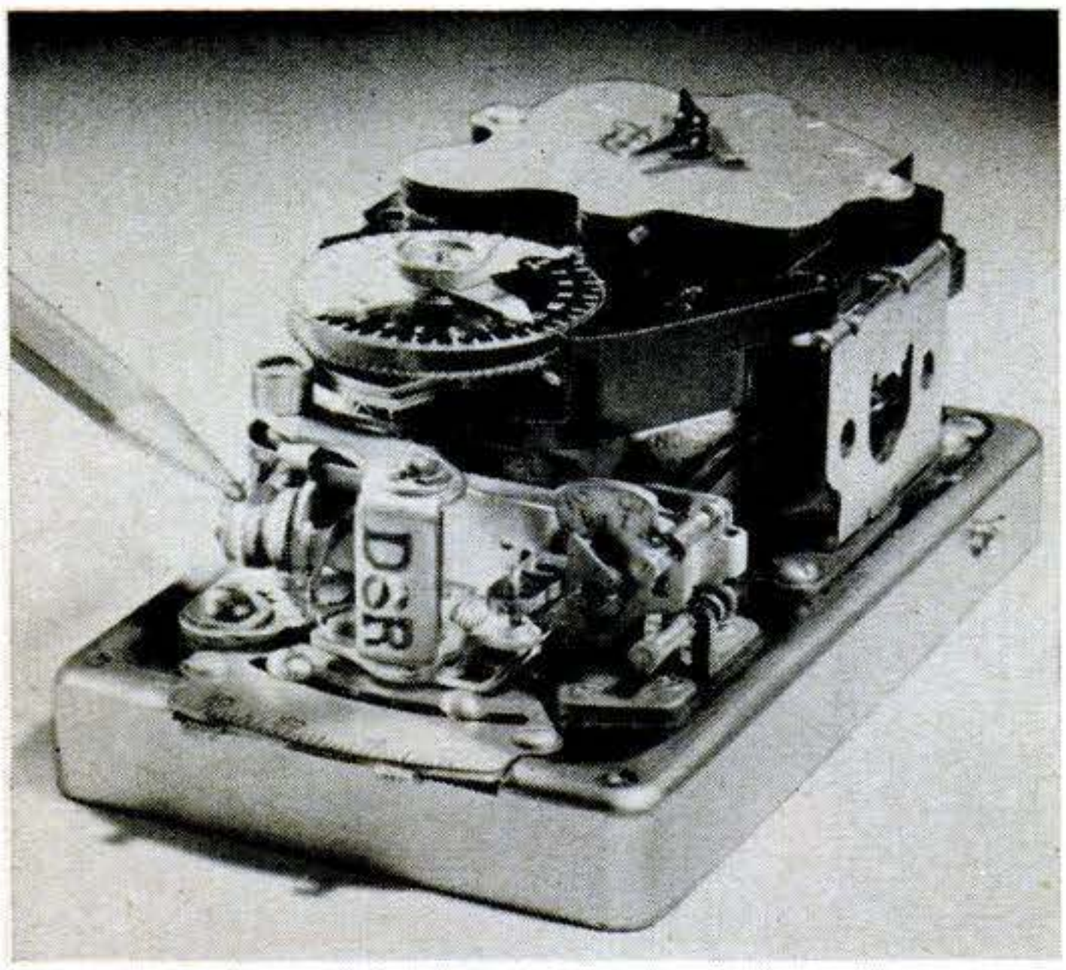

Photo shows actual appearance of mechanism in TM Comfort Chronotherm, a modern clock thermostat, with cover removed. Pencil points to electric heating element described in text.

desired point, the sensitive strip draws away from the contacts, opening the electric circuit and shutting off the burner.

In this fashion a modern thermostat will maintain a room temperature that fluctuates only a degree or two—an imperceptible amount—from its setting.

To make the temperature setting, tension of the springy U-shaped strip is varied by either of two means of adjustment. It may be done manually with a lever or automatically by a clock thermostat's timer.

The Clock and Timer

The timer is a rotating assembly mounted on a single shaft. Driven by a self-starting electric clock through a train of gears, it makes one complete revolution every 24 hours. At its top is the black-and-white time dial, with black marking nighttime hours and white, daytime ones. At its lower end is a cam, of thin multiple leaves that may be spread like a fan. When the "Hi" and "Lo" pointers are adjusted, they set the cam's position and the spread of its leaves.

At the hour chosen for the nighttime shutdown, the revolving cam engages a roller on a cam-following lever, and stretches a coil spring. The spring, in turn, swings an arm that applies tension to the sensitive thermostat element and lowers its temperature setting. The result is the same as if you pushed down the daytime-temperature setting lever.

When the hour chosen for the end of the shutdown period arrives, the cam releases the spring and the tension-applying arm. This restores the thermostat element to its daytime setting, just as if the manual lever had been moved up again.

Actually the timer does not move the manual levers. The upper lever provides a permanent setting for daytime temperature. The lower one acts simply as a mechanical stop, to limit the lowering of this setting at night. If you're having a late party, push the nighttime lever up to the daytime one; heat stays on, until guests have gone and you restore the usual setting.

For simplicity, this brief description and the explanatory drawings accompanying it have skipped important refinements, built into such modern clock thermostats as Minneapolis-Honeywell's TM Comfort Chronotherm, which is shown in the illustrations.

New Thermostats Look Ahead

Chief of these is a thermostat with the uncanny ability to sense, not only what the room temperature actually is at the moment, but what it will be a little while later! Because of this prophetic power, it can maintain an even temperature with precision.

With earlier and simpler thermostats, houses often got too warm, then too cool. As room temperature drops, such a thermostat will faithfully call for heat—but there's an inevitable lag before heat comes up, and meanwhile the room may become uncomfortably chilly. When the room does warm up and reach the desired temperature, the thermostat will obediently shut off the burner—but it can't turn off heat still coming up the pipes, and some overheating is bound to result.

The modern remedy has been to build a small electric heating element into the thermostat itself. In the model described here, this heating element is attached directly to the sensitive U-shaped bimetal element. It is so connected that current flows through it while the thermostat contacts are closed, and stops flowing as they open.

Extra heat from the heating element slightly advances the time at which rising room temperature "satisfies" the thermostat. Its contacts open, averting overheating. In a short time, absence of heat from the auxiliary element renders the thermostat "unsatisfied" again and its contacts close, restarting the heating plant in time to avoid underheating. Short and frequent burner operation results, favoring even distribution of heat through a room's air and avoiding hot and cold layers. END

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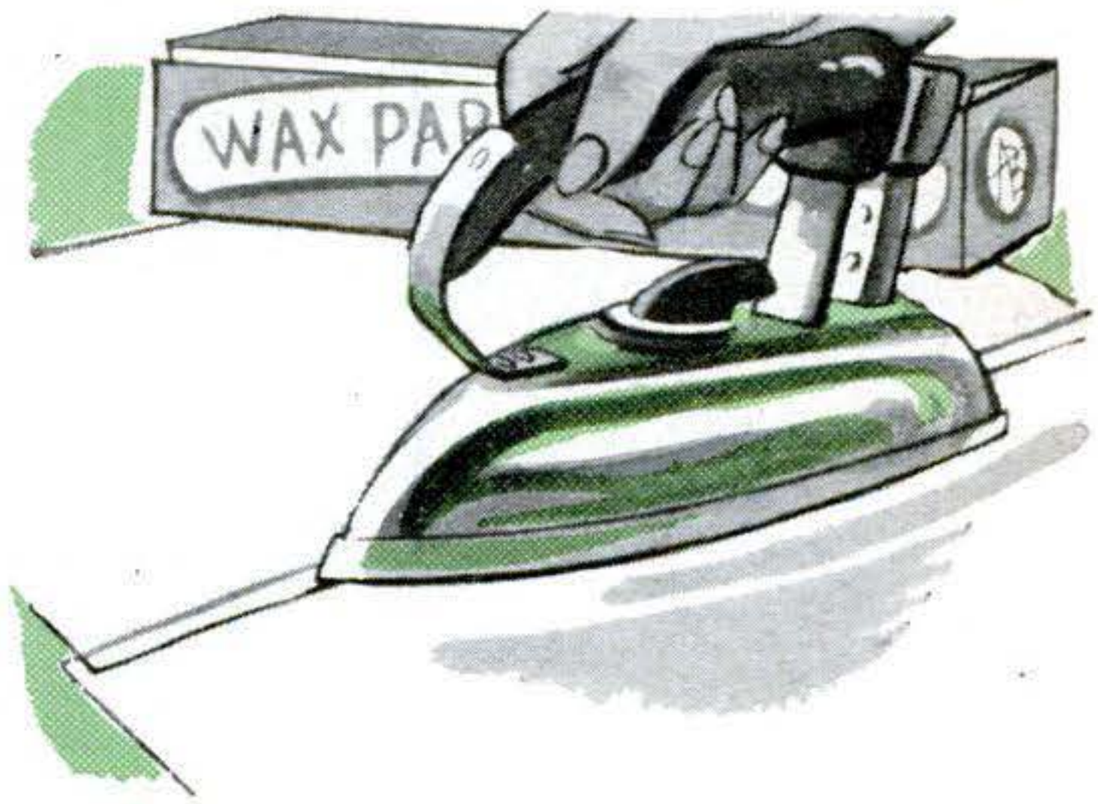
Keeping the Home Shipshape

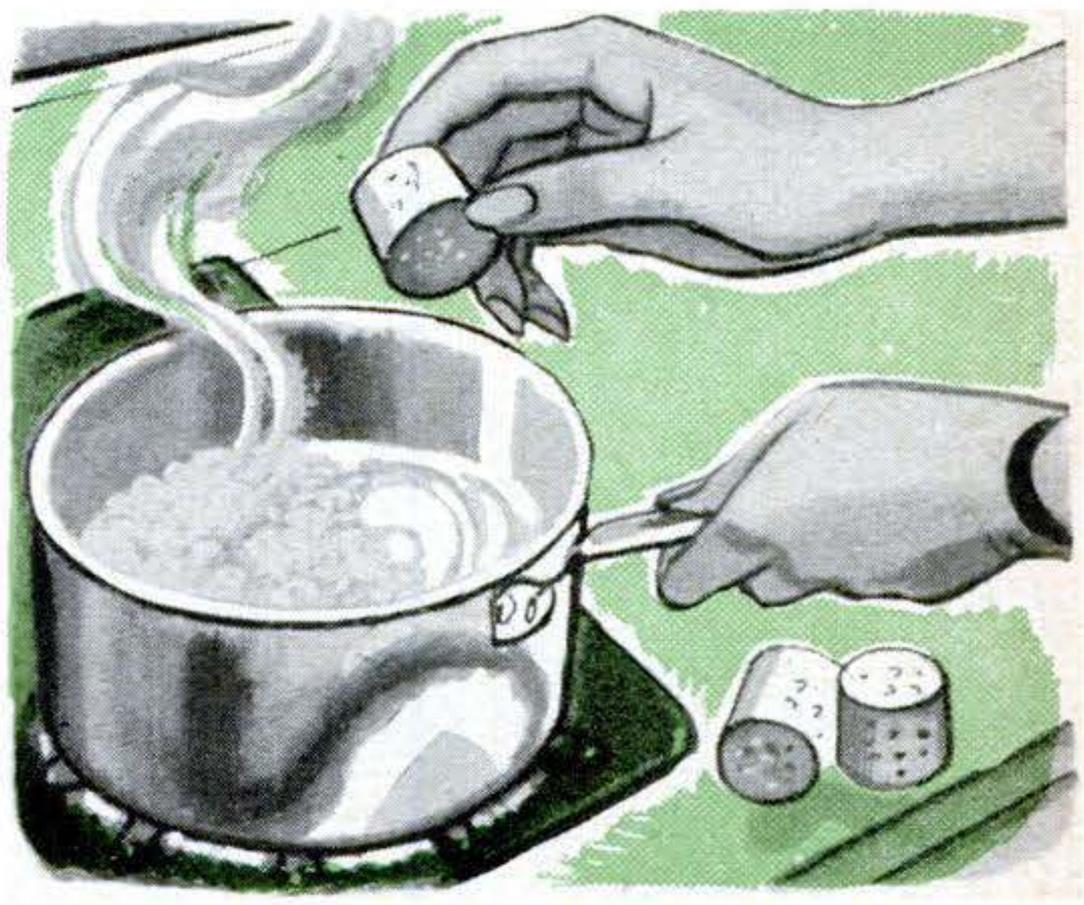
When machine-sewing on a slick-finished material that keeps sliding, put a rubber drainboard mat on the sewing-machine extension board. It will provide a nonskid surface.

Burn old flashlight batteries in the fireplace now and then. The burning zinc may help prevent soot formation, and the metals and chemicals make colorful flames.



Extra-large sheets of wax paper for carrying cakes and pies to a family Thanksgiving are easily made. Overlap regular sheets and join by pressing the seams with a hot iron.

Scratches and scuffs on hardwood floors can be temporarily concealed with shoe polish or with a wax crayon of suitable shade. Blend it in well with the surrounding wood.



If vacuum-bottle corks harden and shrink from age, they can be given new life and made to fit again by boiling them a short time in a covered pan. This expands the cork.

Please turn the page for five more suggestions.

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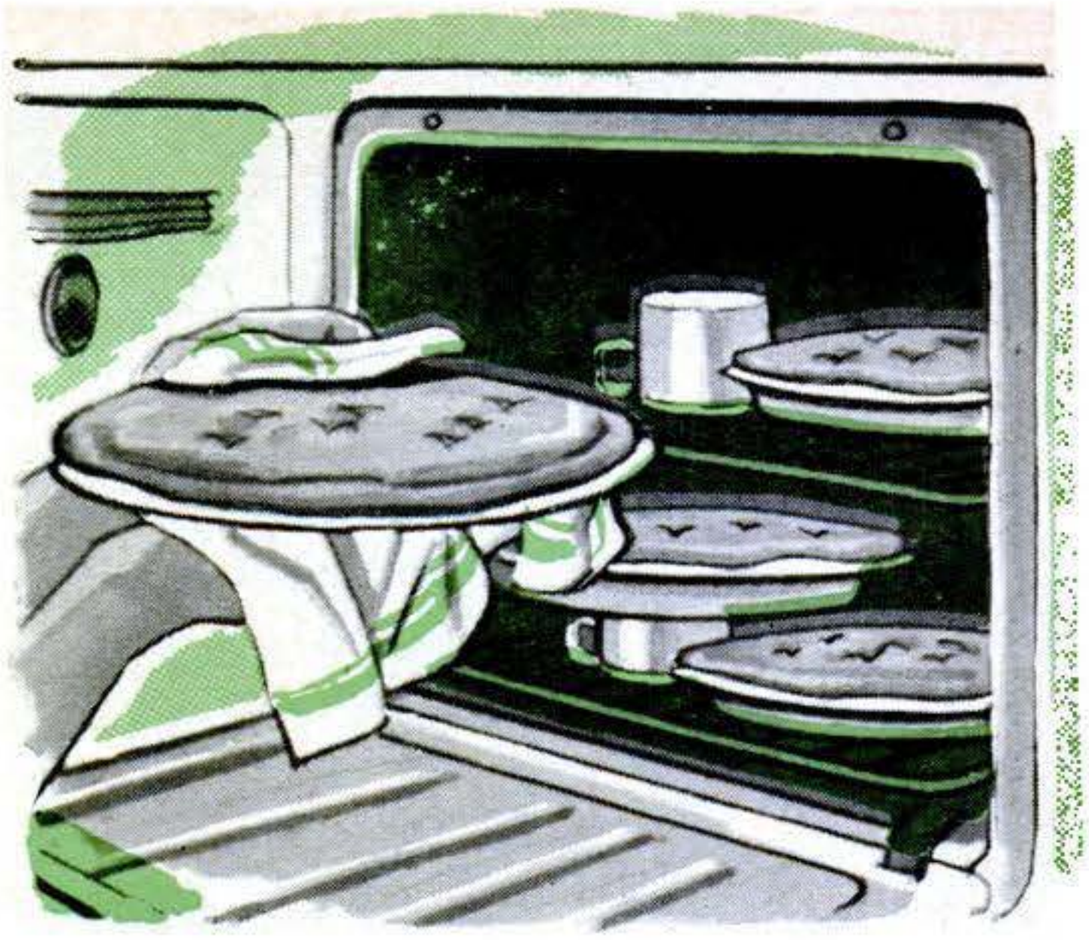
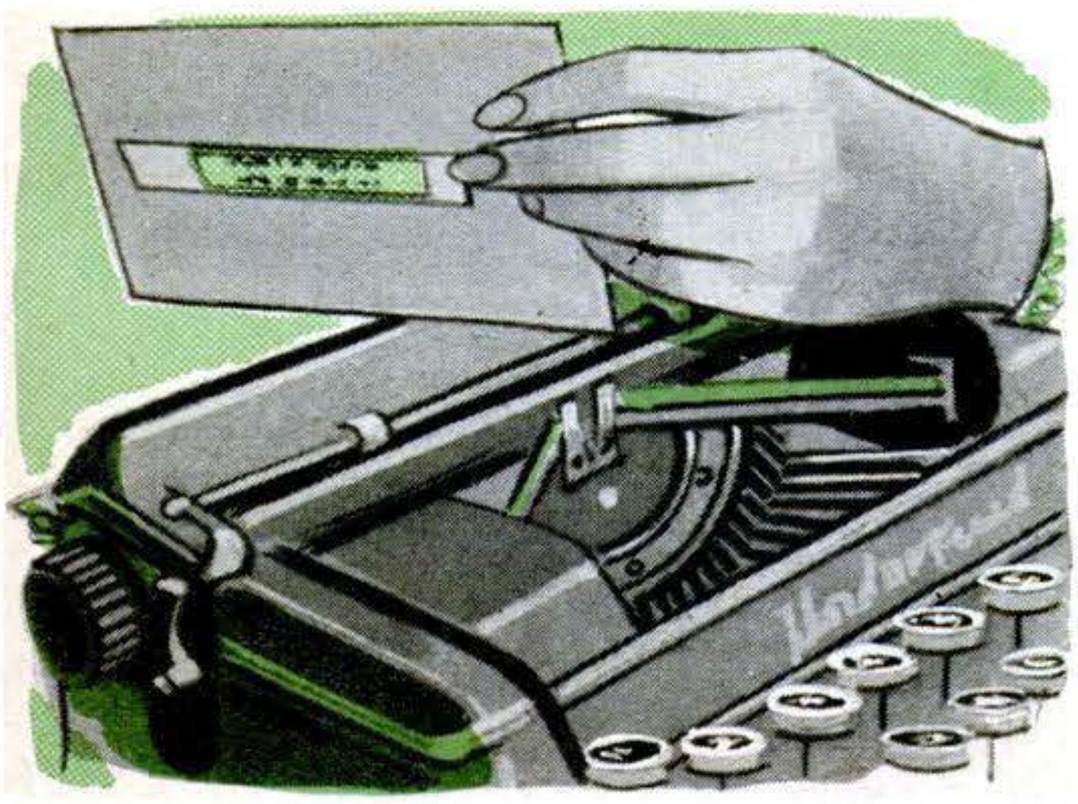
Keeping the Home Shipshape

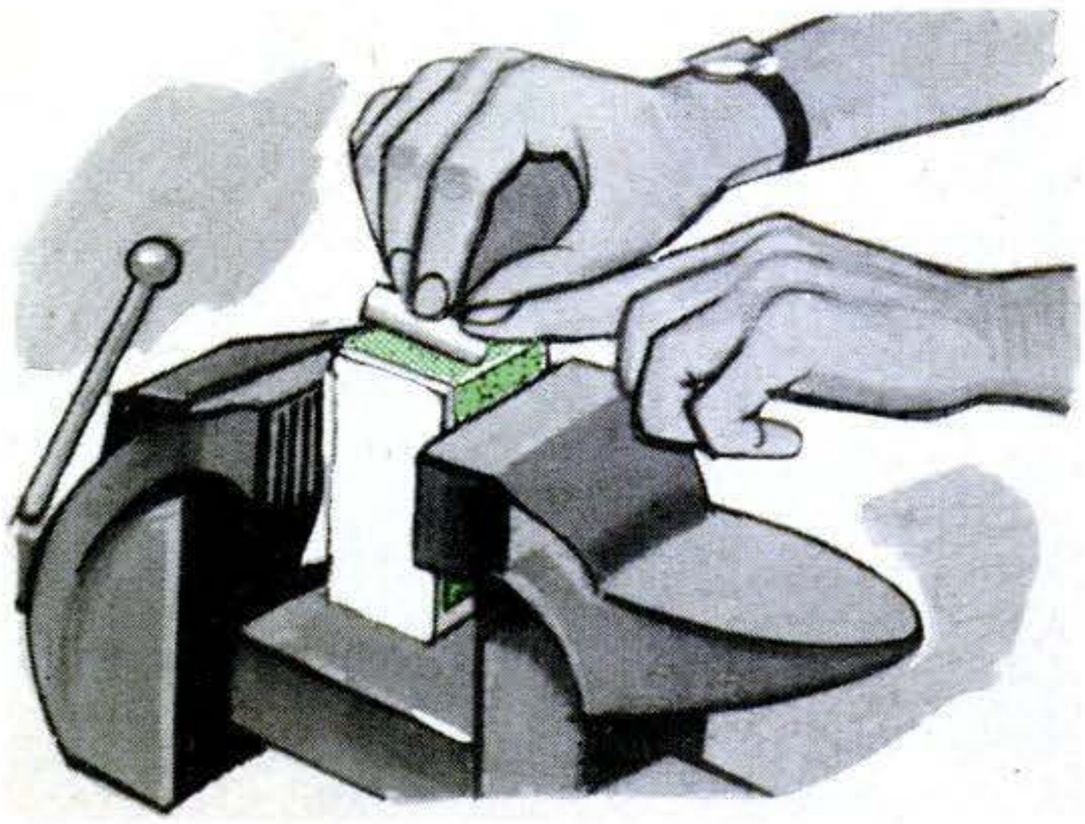
A hot dinner can be kept warm for a latecomer if you cover it with an upside-down pie tin. A pot-lid handle screwed to the center of the tin makes it easier to lift.



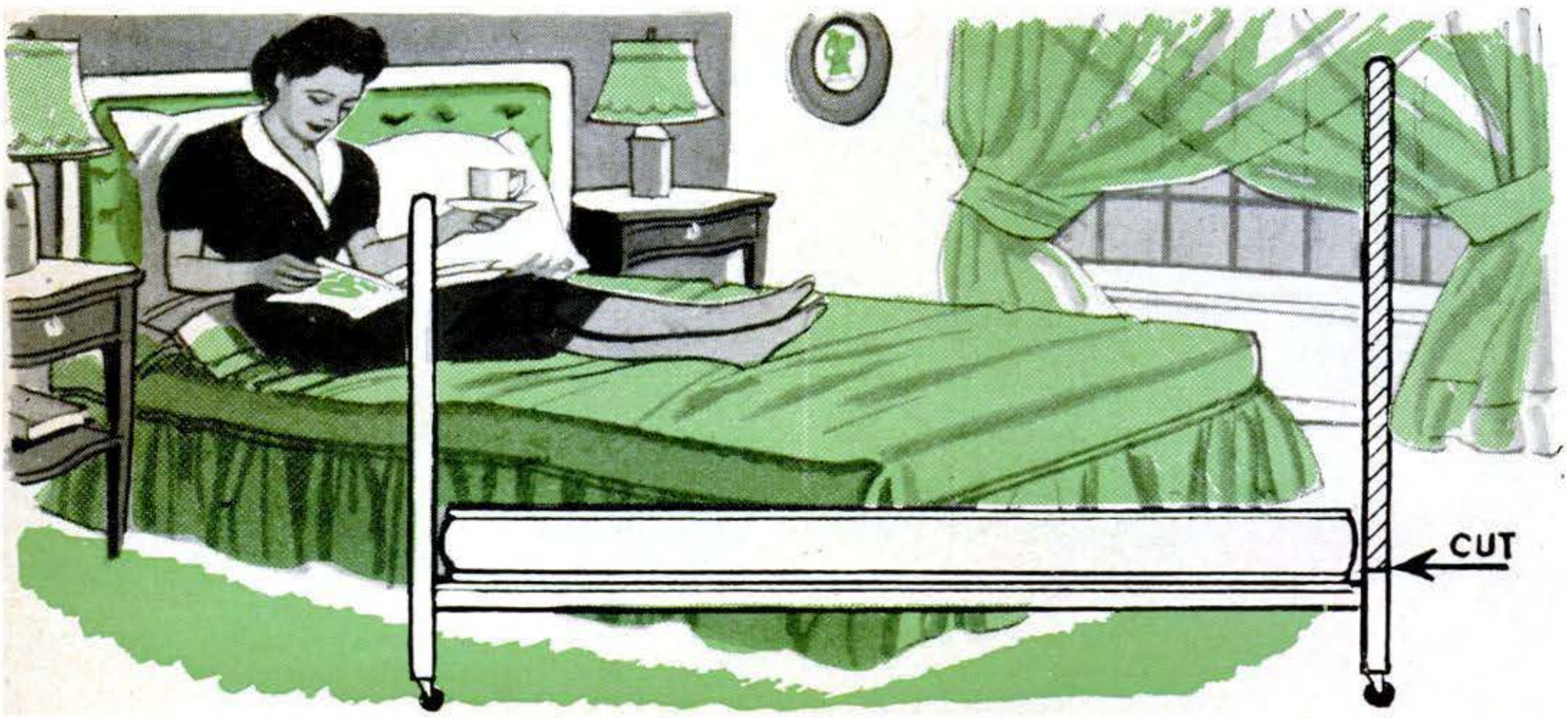
An oven gets crowded if four or five pies are being baked at once. Put metal cups on the shelves and set some pies on them. More pies will fit in, saving fuel and time.



Clean typewriter type this easy way. Cut a slot in a card and cover it with cellulose tape. Insert card in typewriter, sticky side out. Type alphabet over with ribbon out of way.



Sanding very small work is a problem if it can't be clamped in a vise or is hard to hold in one hand. Wrap the sandpaper over a block and clamp it in the vise instead.



Modernize an old bed by sawing off the headboard as low as possible. Use the footboard as the new headboard and upholster with a quilted fabric or plastic.

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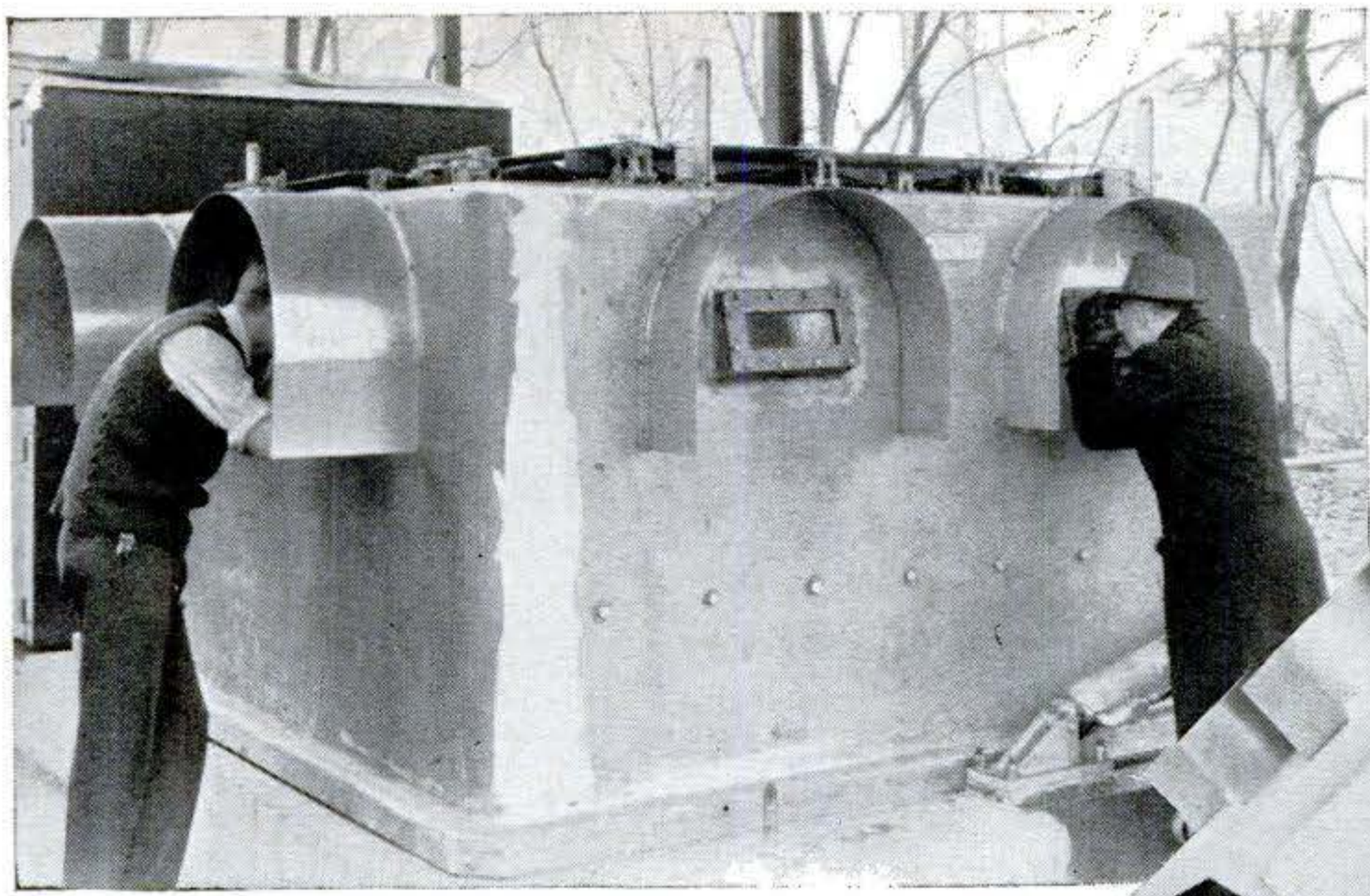
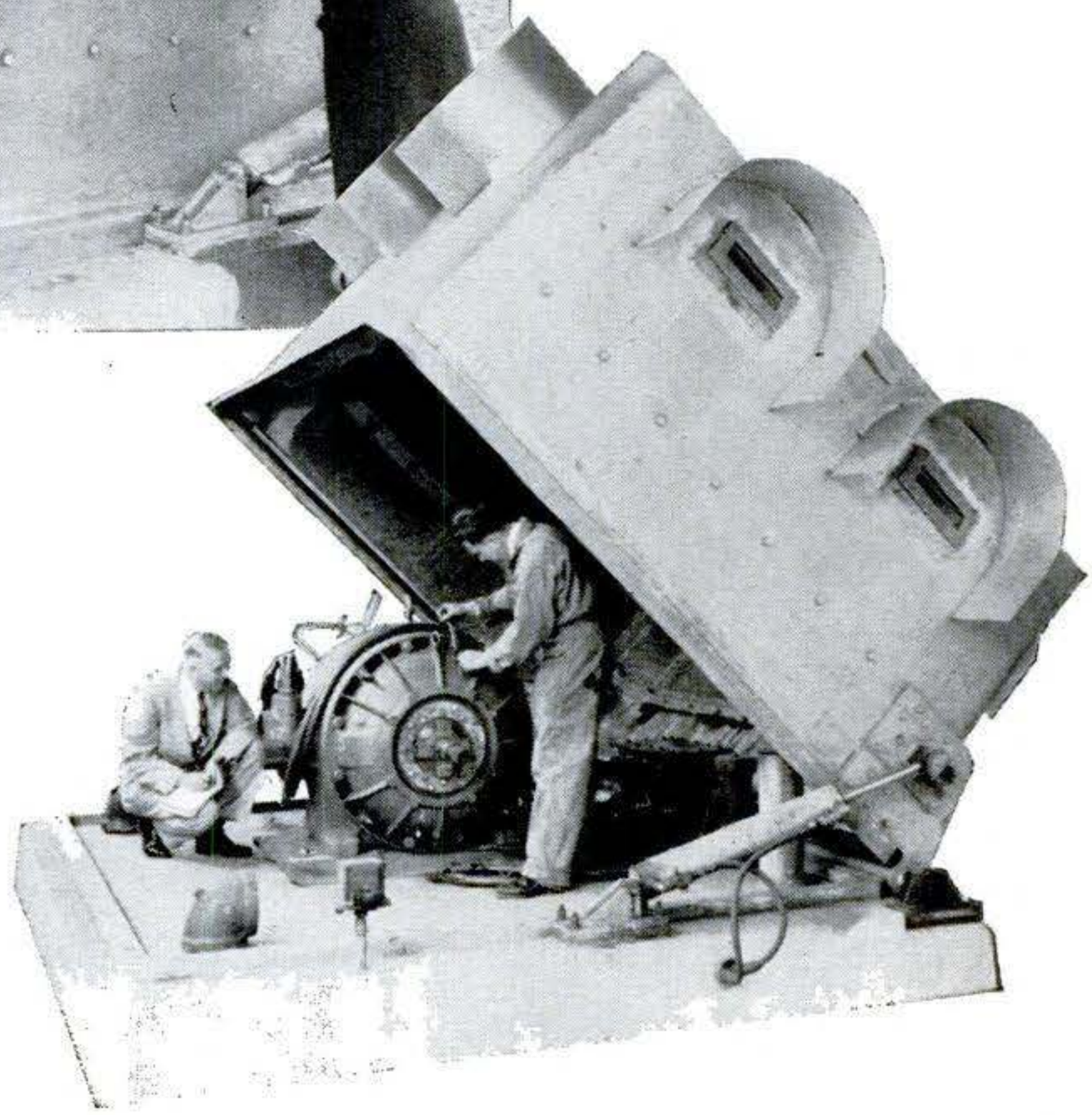


Peering through shatter-proof glass windows, engineers of the U. S. Bureau of Mines watch to see if an exploding gas-air mixture inside a piece of electrical equipment will set off the rest of the inflammable vapor surrounding the equipment in the test chamber.



Explosion Chamber Spots Motor Hazards

ELECTRICAL equipment that might ignite explosive coal dust or gas-and-air mixtures in coal mines is quickly detected by this new explosion test chamber. The hood of the chamber is raised by hydraulically operated hinges, as in photo at right, which shows engineers preparing a motor for a test. When the hood is lowered, an explosive mixture of gas and air is pumped into the chamber and inside the motor housing. A spark plug ignites the gas inside the motor. If the resulting explosion is confined within the motor, it passes the safety test and is given an explosion-proof rating. If it fails, the explosion is released through diaphragms on top of the chamber. In the case of coal-mining machines, each electrical part must pass at least 10 explosion tests before it is approved by the U. S. Bureau of Mines for underground use.

Inflatable Plastic Hat Keeps the Rain Off

THE raincoat the young lady below is wearing will protect her clothing from the rain. But what about that nice hairdo? Nothing to worry about. She digs in her purse, and takes out a little package. A few easy puffs into a valve, and a tubular rim is inflated to make a hat the size of an umbrella. Under the big top, she has both arms free for carrying packages and purse. The rain bonnet, made of Vinylite plastic, is said not to crack or peel even after repeated foldings. It comes in red and blue plaid and in plain colors. Rain Bonnet, Los Angeles, makes the umbrella hat.

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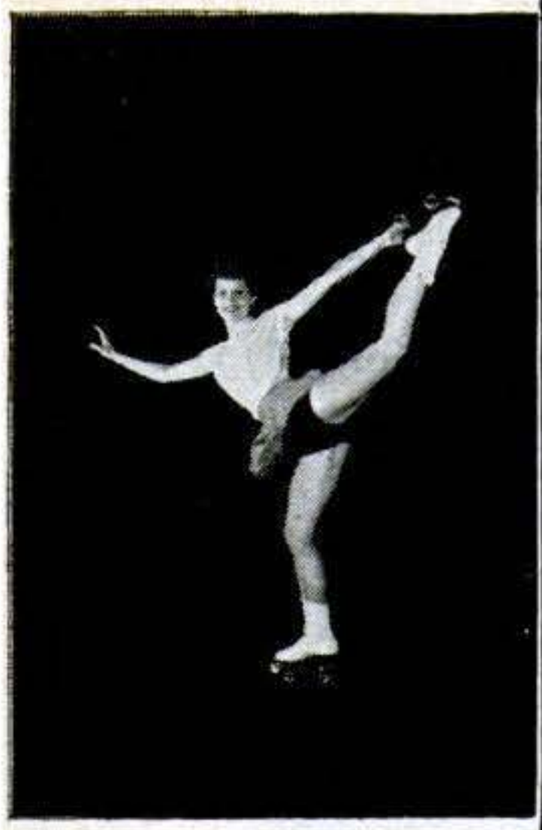

The skates this girl is lacing on are precision-built. With the shoes, they cost more than $100. Fancy skaters use them.

How Rink Rollers Are Made

Roller skating is just for kids? Not at the rollerdrome, where the champs do their stuff in $100-a-pair skates.

By George H. Waltz, Jr.
PS PHOTOS BY W. W. MORRIS

ONE hundred dollars for a pair of roller skates?

That's a lot of money for eight wheels mounted on a pair of shoes. Yet, many of the youngsters wheeling, spinning, jumping and dancing at your local roller rink this month paid that much. Maybe more.

Top-quality rink skates, the kind preferred by serious amateurs as well as professionals, are no longer a stamped-out product of an assembly line. They are precision-built to take the strains and stresses of dance, figure and free-style skating, to say nothing of "roller derby" skating.

Skilled workmen produce them by hand on small machine tools—small drill presses, arbor presses, bandsaws and jigs and fixtures—the kind you find in a well equipped metal-working home shop. One of the most popular—and expensive—precision-built roller skates made today, in fact, was first made in a small basement workshop.

Four years ago, dark-haired, stocky Rocko DiCandia, then in his middle twenties, was a machinist employed in a plant in Brooklyn. His evenings were divided between two pet hobbies—puttering around in his basement shop and roller skating.

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Like other ardent rink fans he often stopped at the local skate shop to join the bull sessions about skates and skating. Leo Monte, the owner of the shop, soon realized that Rocko DiCandia was an expert machinist and metal worker. And DiCandia discovered that Monte and his assistant, "Doc" Parker, a gray-haired oldtimer at the skating game, had some pretty sound ideas about how a top-quality roller skate should be built.

DiCandia and his younger brother enlisted the off-time help of a few mechanically minded friends, and began producing precision-built roller skates according to Monte's and Parker's design. During the first year, they produced almost 200 pairs of these de luxe skates in DiCandia's basement shop.

Rolls-Royces of the Rollerdromes

That was in 1949. Today, Rocko DiCandia, still under 30, no longer spends his days working for someone else. He has his own modern one-story plant in Maspeth, Long Island, where each spring he and his brother supervise a half-dozen employees in the production of more than 1,000 of the now famous "Glideaway" roller skates for the fall and winter seasons. The rest of the year, they run a profitable tool, die and sheet-metal shop.

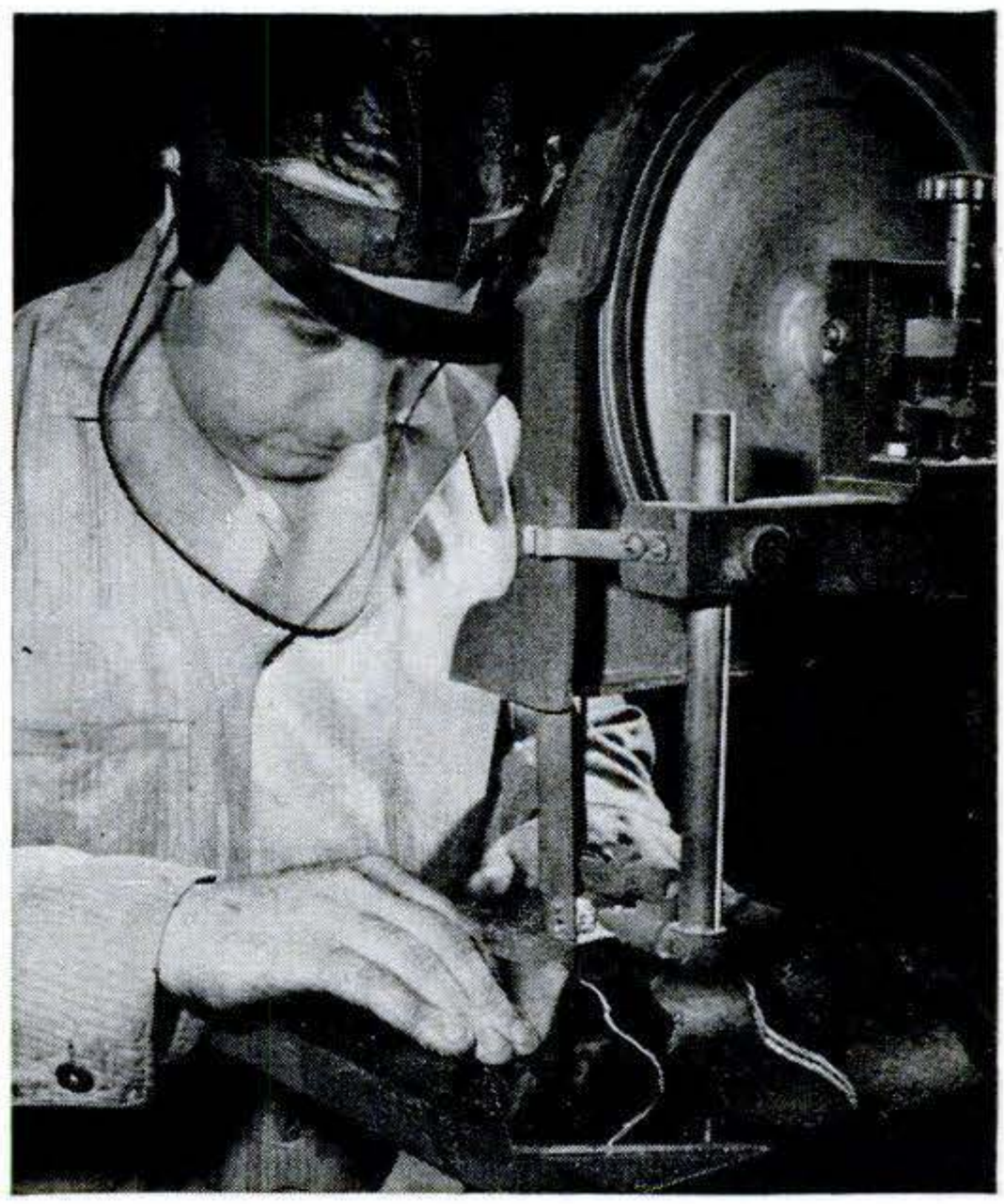
Leo Monte, who was responsible for getting Rocko into the skate business, now distributes DiCandia's "Glideaway" skates. He and "Doc" Parker also operate a pair of skate shops—one in Manhattan as well as the original one in Brooklyn.

The skates that DiCandia and the other manufacturers of precision rollers turn out are a far cry from the steel-wheeled strap-on variety that sell for a few dollars. They might well be called the Rolls-Royces of the rollerdromes.

Skaters Are Rugged Individualists

The trucks for the wheels and the hangers for the trucks are made of tough aluminum alloy. Special tool steel is used for the axles, while a heat-treated alloy steel is used for the kingpins that hold the trucks in place. And to provide just the right "action"—that's the amount of rock-over, or roll, from side to side—the trucks are cushioned by rubber pads that can be adjusted to different resiliencies.

Since roller fans are rugged individual-



Rocko DiCandia, manufacturer of one of the top precision-built skates, started making them in a basement workshop. Now he has a modern plant located in Maspeth, L. I.

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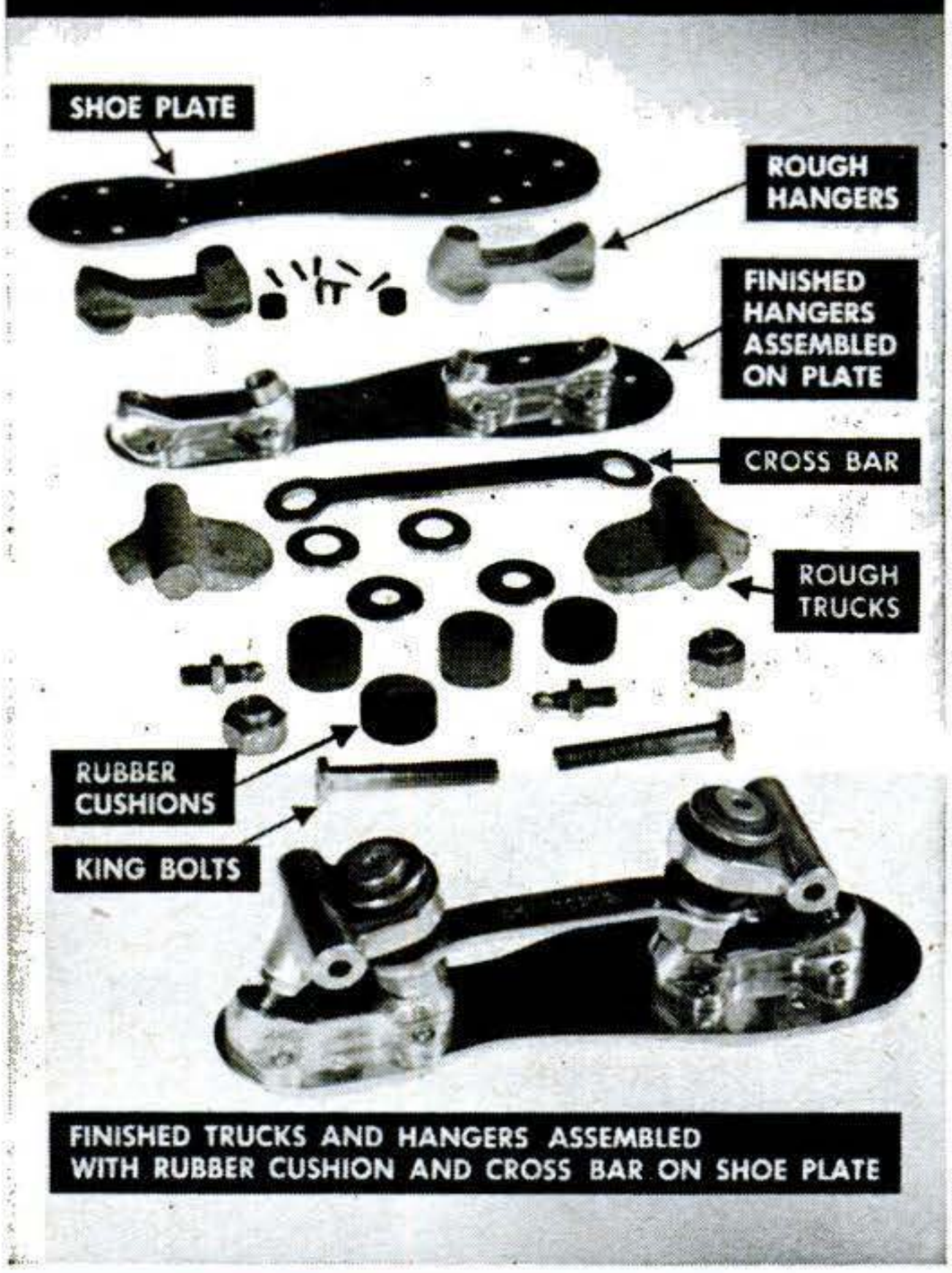
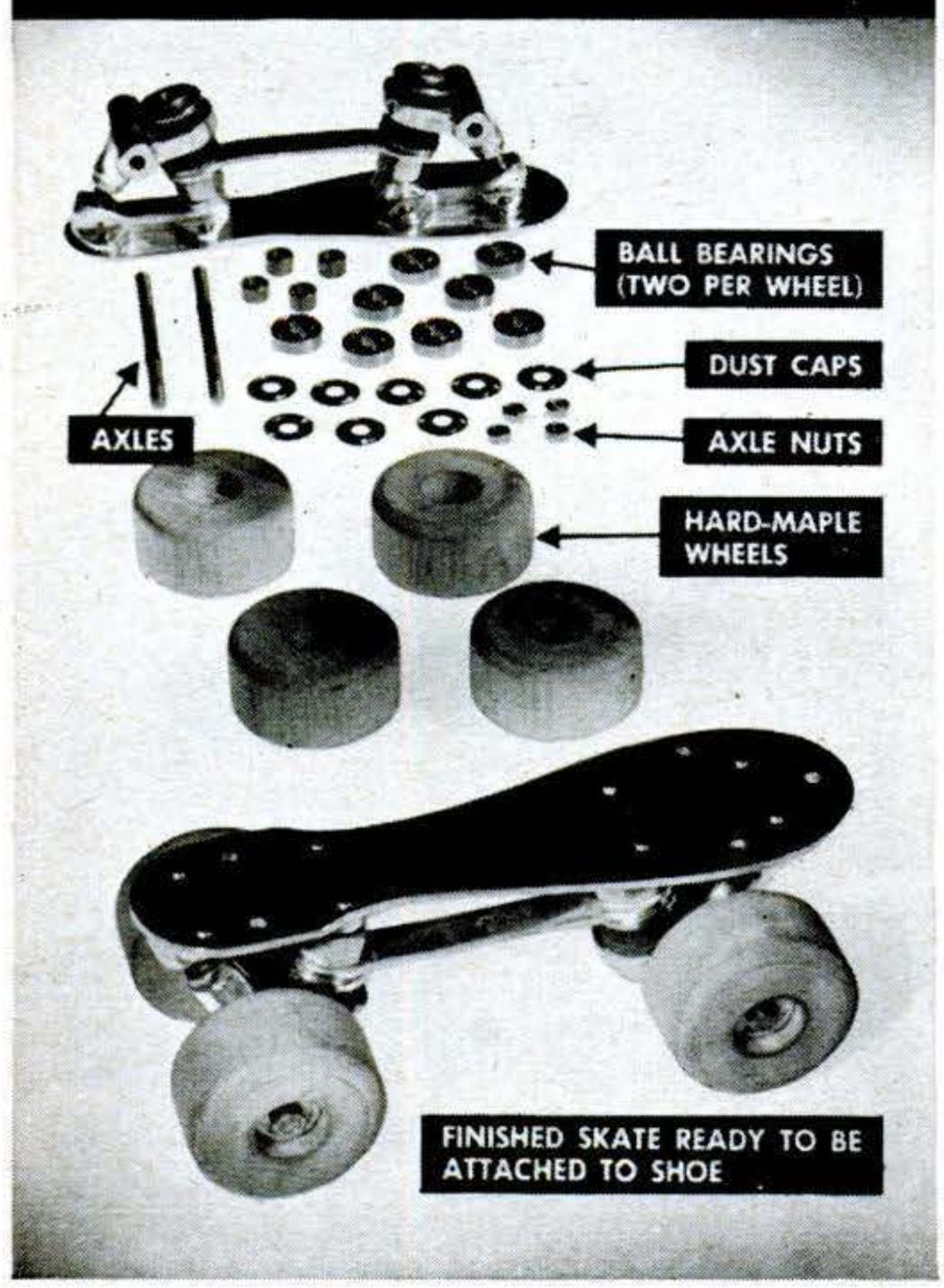
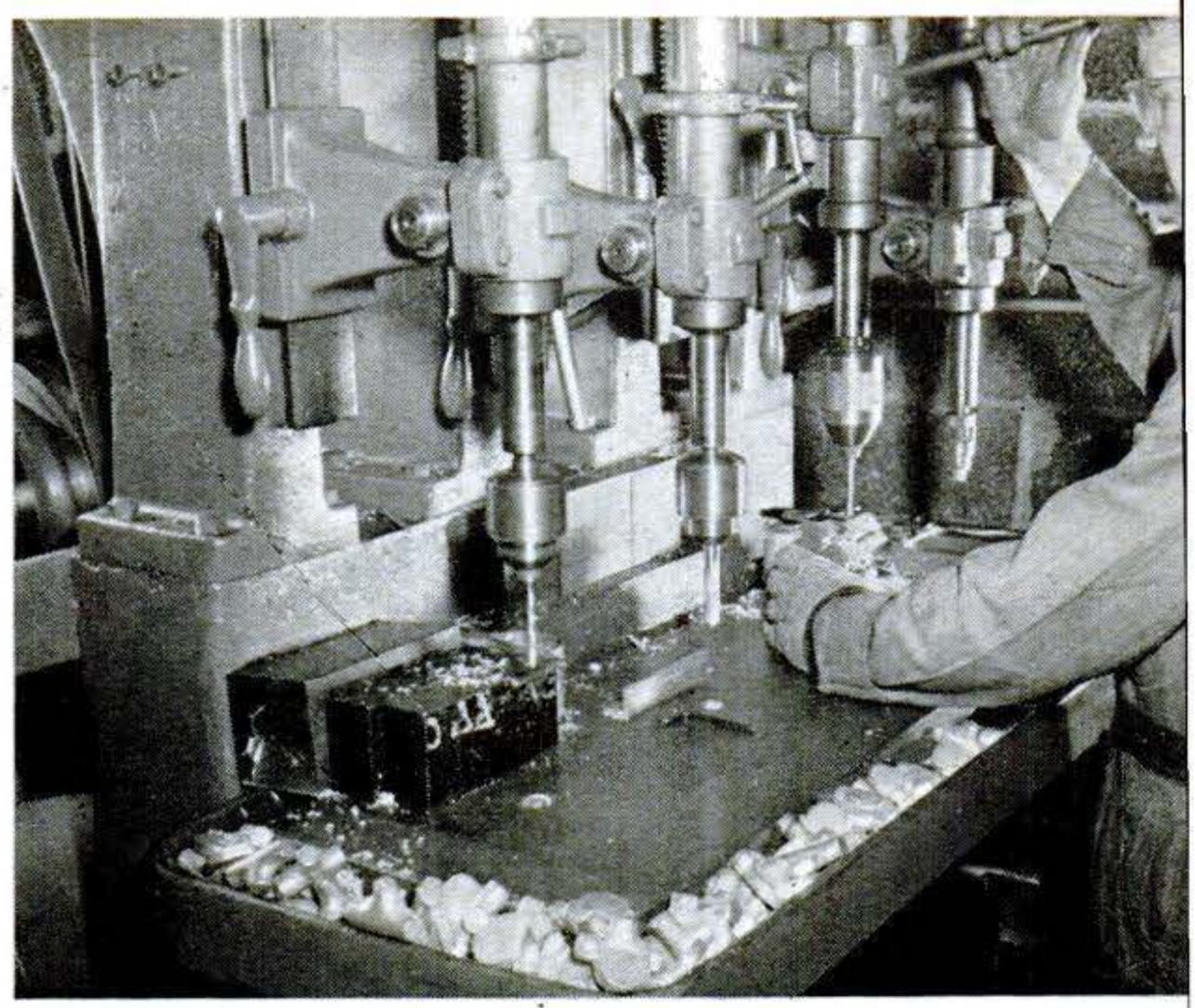
THE MANUFACTURER ASSEMBLES THESE PARTS



THE DEALER FINISHES THE SKATE



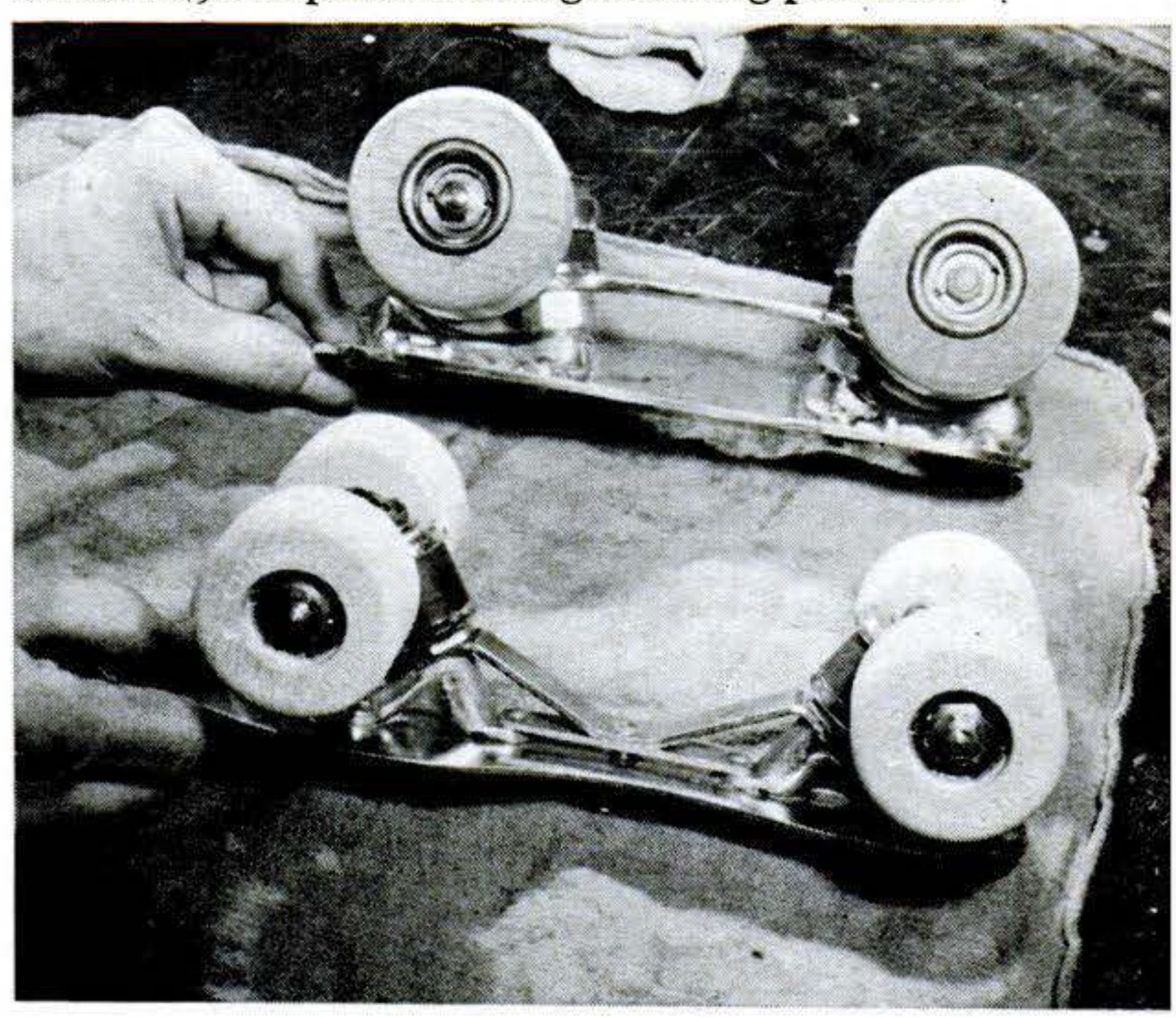


Drill presses play a large part in manufacturing DiCandia's "Glideaway" skates. Castings made of a special aluminum alloy are bought and then drilled as required and finished.

ists, most precision skates are sold without wheels. The buyer selects his own. Most skaters prefer solid hard-maple wheels—to match the hard-maple board surface used on most rinks—but others want plastic wheels, fiber wheels, laminated wheels or wheels made out of the asbestos composition used for automobile brake linings.

Wheel diameter and wheel width also are matters of personal preference. And for short gals who like to skate with tall boys,

Racing skate (in foreground) differs from skate used by dance, figure and free-style skaters. The king bolt holding the trucks forms a wider angle to provide a longer skating platform.



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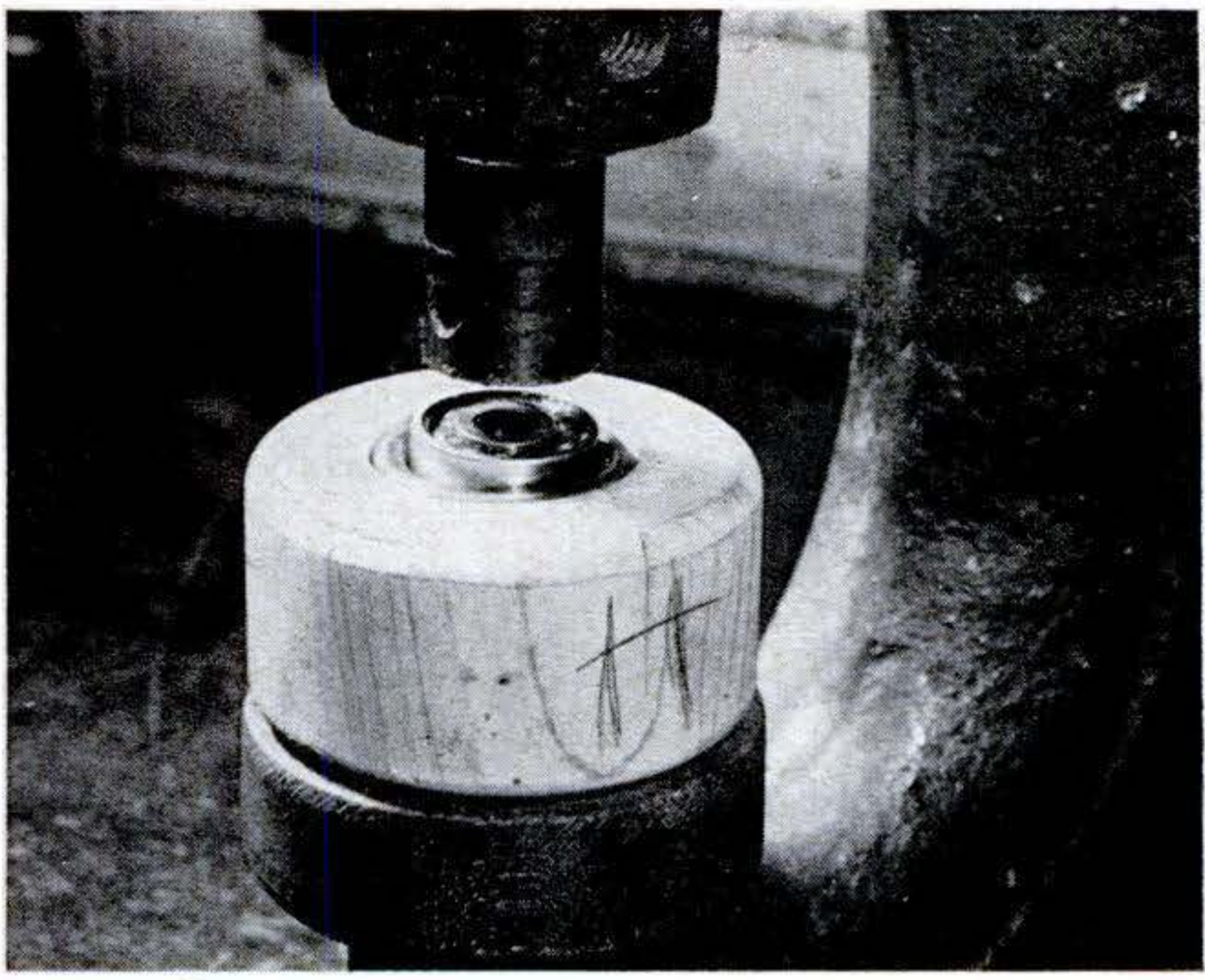
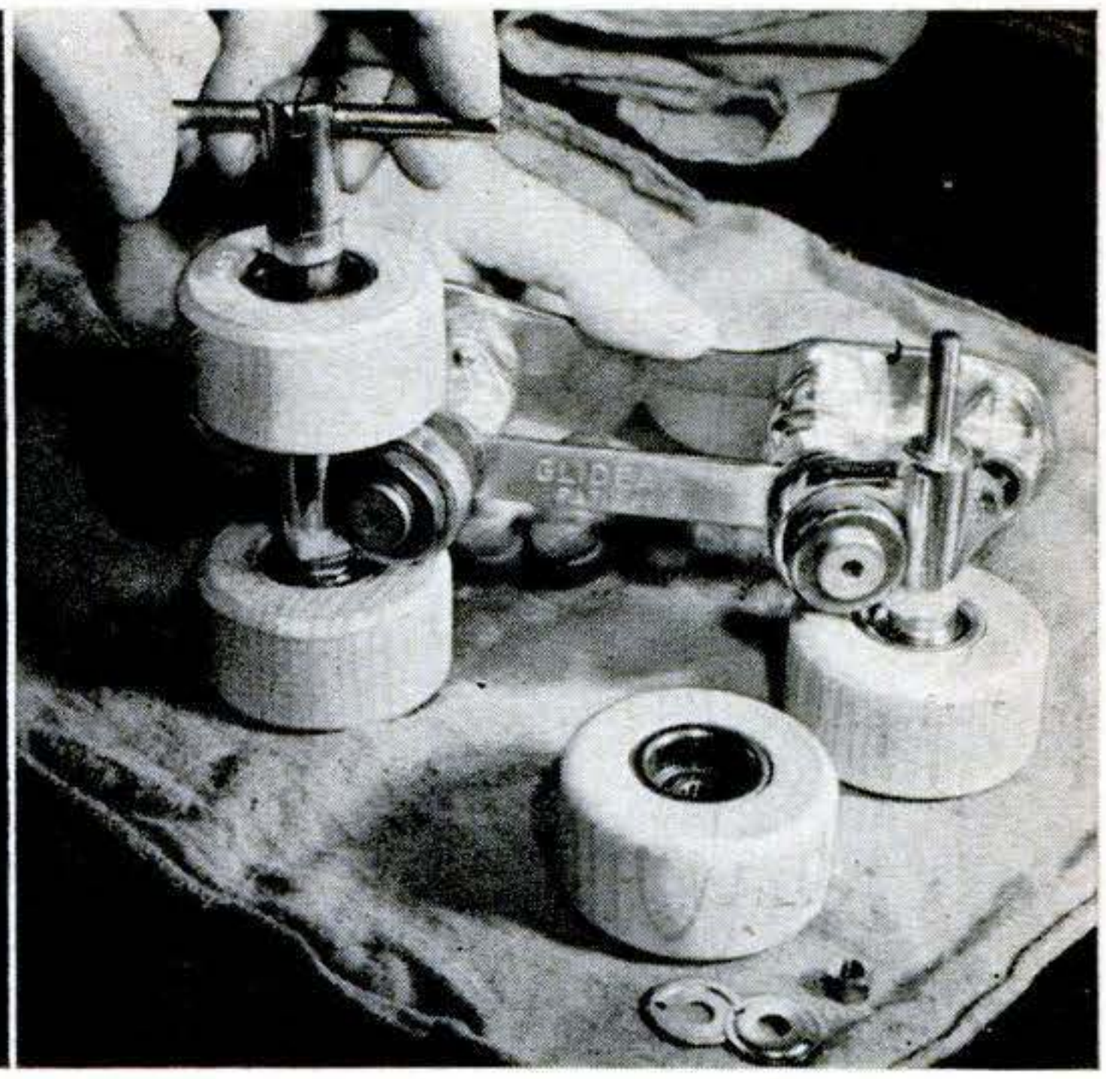


Hard-maple wheels used on skates roll on two sets of ball bearings—one is placed on each side of the wheel, with a spacer between. Bearings are pressed into the wooden wheels.



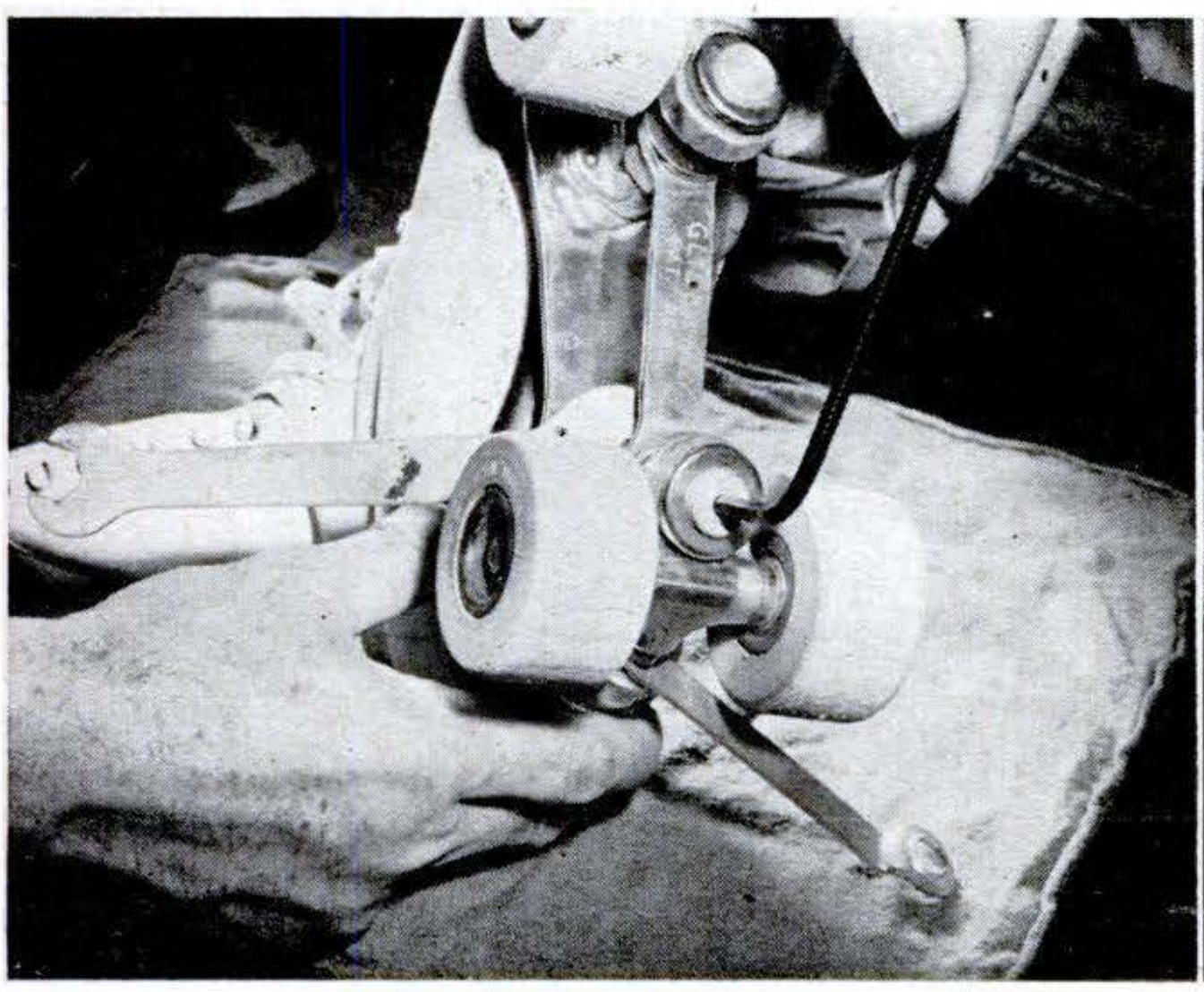
Actual assembly of wheels on skate is done by the dealer at the time he sells the skates, as indicated on opposite page. Dust caps are placed over bearings before nut is put into place.

there's even an extra-large-diameter "now-she-can-be-as-tall-as-you-are" wheel!

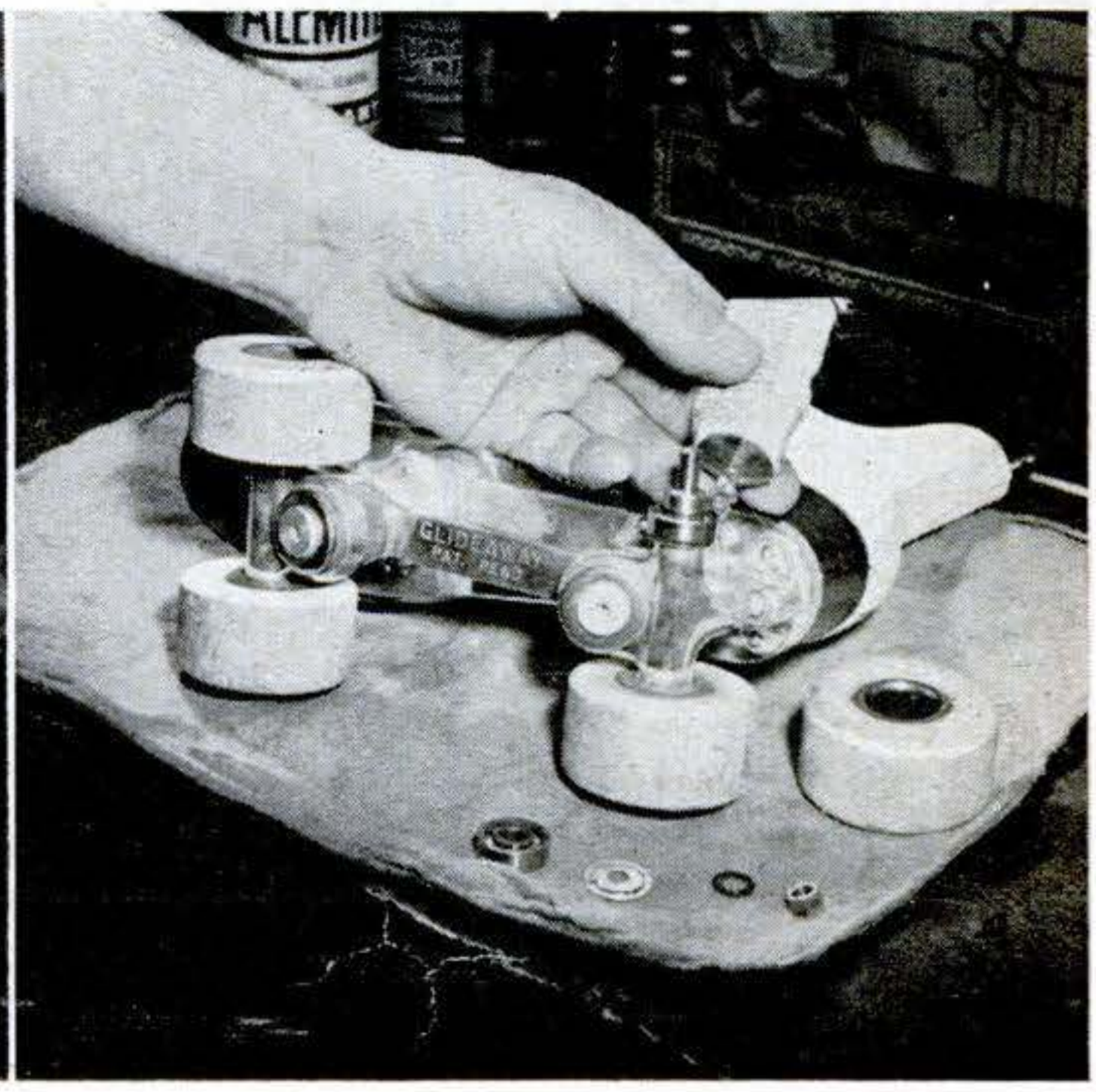
Roller-rink skates, like ice skates, require periodic grinding but not for the same reason. Ice skates are ground to sharpen them; roller wheels are ground to resurface them, to remove any irregularities caused by wear. In roller skating, they—in effect—sharpen the surface of the rink rather than the skates, coating the maple floor boards with a mild abrasive that provides just the right amount of "tooth" to prevent skidding and sliding. This abrasive may be plaster of Paris or pulverized stucco.

If you still think $100 is a lot to spend for a pair of skates and shoes, talk to your local rink owner. The chances are that he paid better than a dollar a square foot for the maple surface of his rink. Figuring the average rink at 200 by 400 feet—and that's comparatively small—that means an initial cost for the floor alone of $80,000! END

Three adjustments can be made in the action of a precision-built skate. Each helps to control the amount that the skater's foot can move from side to side on the rollers.



Wheel lubricants vary. Some skaters like free-rolling wheels, use light oil. Others, particularly fancy skaters who want their wheels to stop when they leave the floor, use grease.



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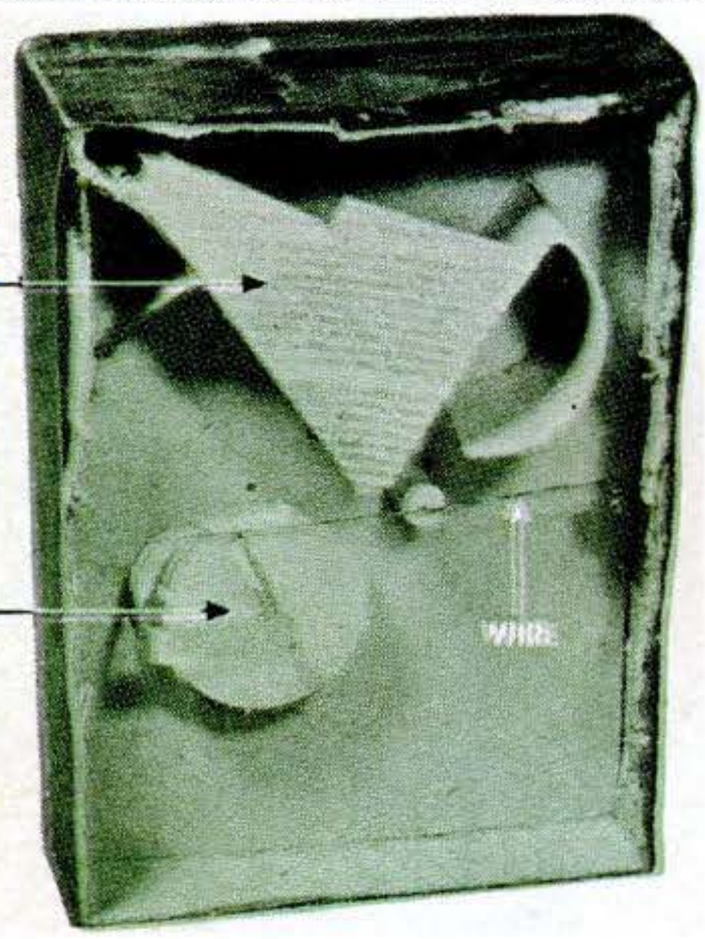
ANTIQUE TOYS STILL DELIGHT THE KIDS

Called "Polly Peddler," this quaint 19th-century doll has about 400 miniature items for sale: mops, playing cards, laces, dishes, jewelry. Women in the past often demonstrated dressmaking ability by outfitting the dolls as elaborately as possible.

To deposit money in this 1896 bank, "William Tell" shoots apple off his son's head. When marksman's right foot is pressed, crossbow shoots coin, placed on its stock as above, at apple. Apple falls back and coin drops into bank. By lowering child's right arm, apple is restored to his head. Toy's original price was $1.50; today it is worth $25.



Built in 1850, this box is a mechanical sand toy. To make the musicians "play" their instruments, it is first turned upside down to collect the sand at top. Then it is righted and sand trickling through mechanism in box causes players to move. Operated like the one at left, the sand toy above has its back removed to show the mechanism. When sand in the reservoir falls on the wheel, a spring activates the long wire that in turn moves the figures.

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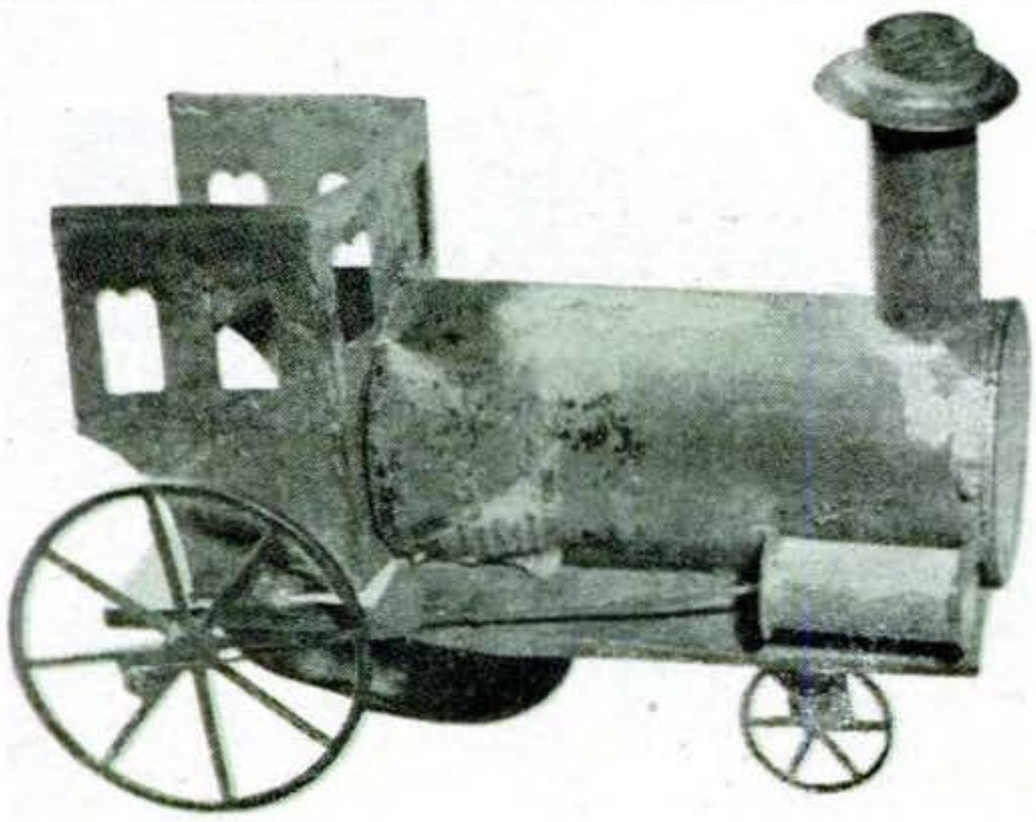
WHEN your great-grandad was a boy, he may well have played on Christmas morning with toys like the ingenious 19th-century playthings pictured on these two pages. In spite of their age, all the mechanical toys shown are still in working condition —a tribute to the skill and workmanship of yesterday's toymakers. Borrowed from private collectors, museums, and manufacturers, these toys are a selection of those displayed by the Toy Guidance Council, Inc., of New York City, at a recent antiques exhibit.

The cast-iron toy above is another mechanical bank. To operate it, a coin is placed in the dog's mouth, and a lever is pressed. This releases a spring-loaded, pivoted bar to which the animal is attached, making him jump through the hoop and drop the coin in the barrel. To make the dog go through his trick again, he is pushed back to his original standing position. Built in 1903, the bank was priced at about $2 when new; it is valued at $50 today.



A clockwork mechanism runs this trackless, tin locomotive, one of the first made by the Ives Co., once-famous toy manufacturer. Built around 1875, original price of the locomotive was $5; as a collector's item it is worth $100.

The crude-looking toy shown in close-up above is the kind of rattle babies played with in the early 19th century. Hand-carved, the rattle has a head made of loose-fitting, interlocking pieces that make a noise when shaken. END

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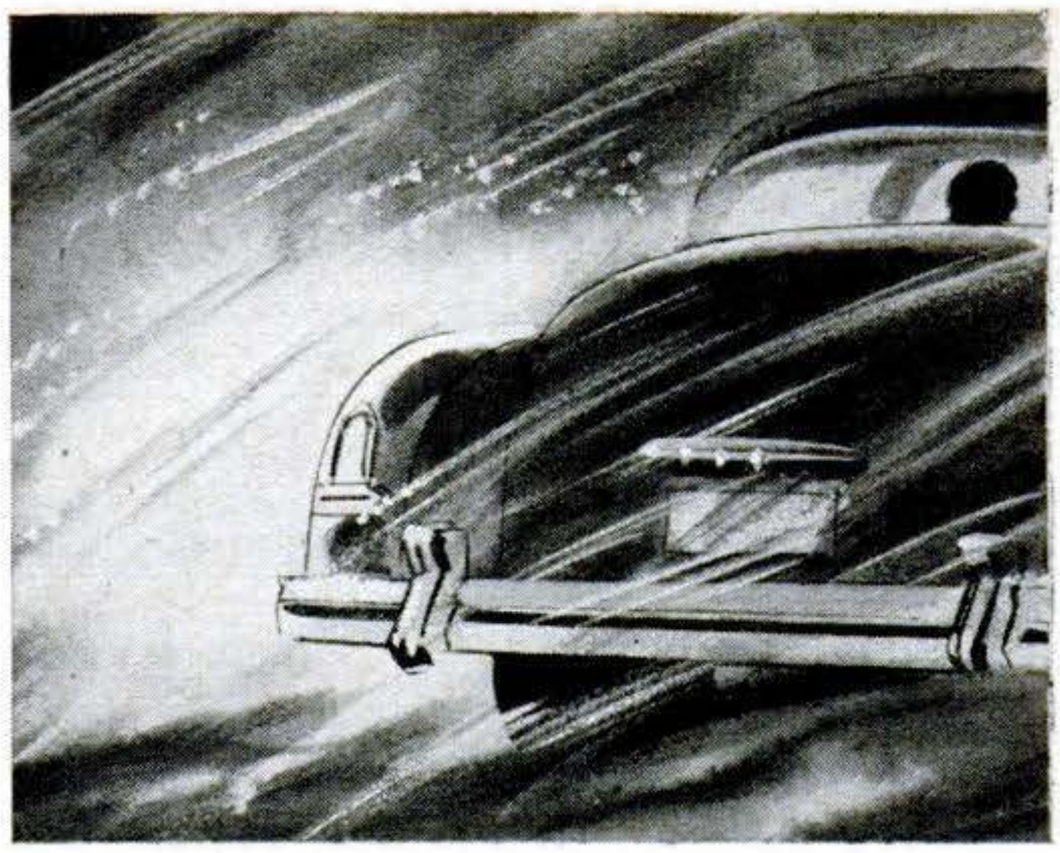
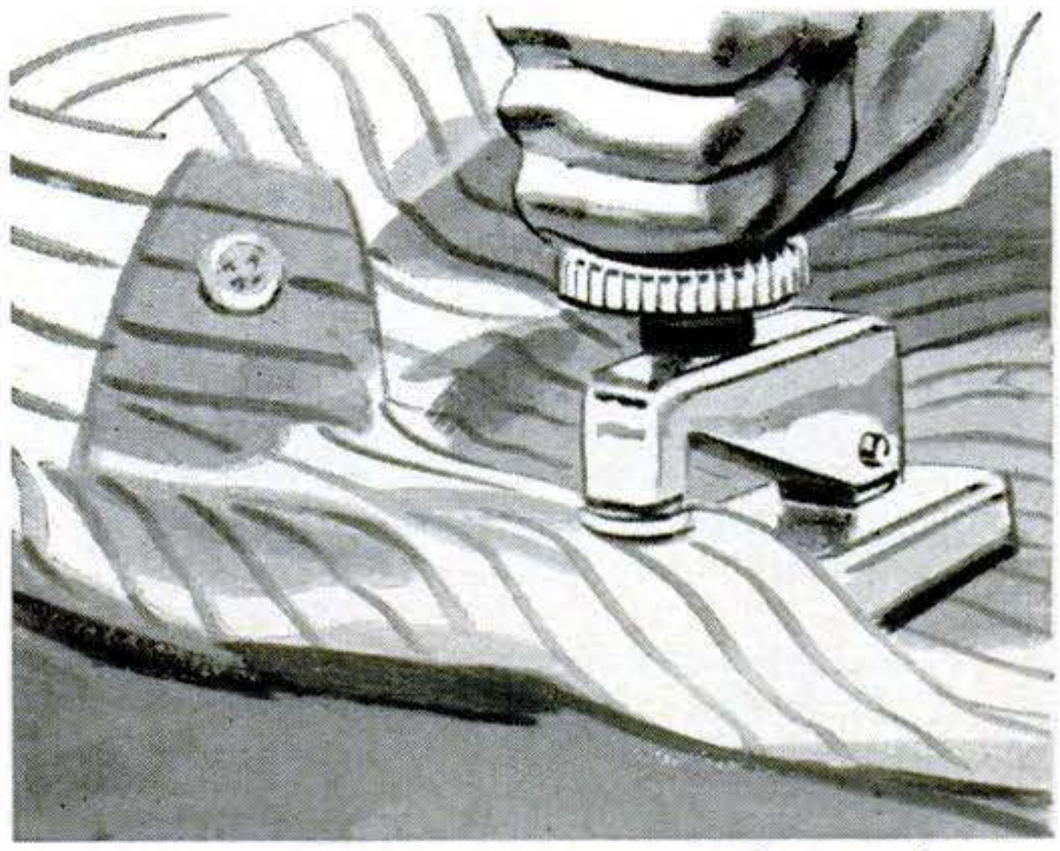
I'd like to see them make...

Everyone has his own pet idea of some gadget he would like to see in general use. What is YOURS? *Popular Science* will pay $5.00 for each one published. Use government postcards only. Contributions cannot be acknowledged or returned.

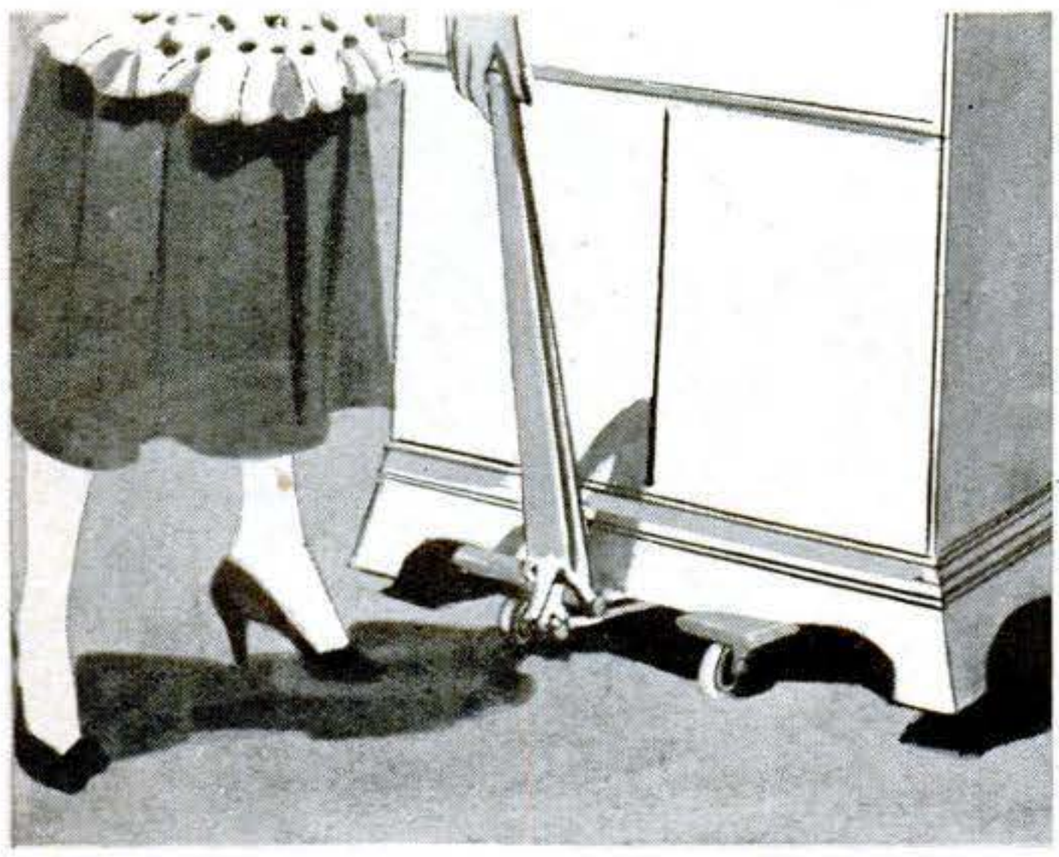


Tail-light bulbs with dual filaments. Controlled from dashboard, light could be switched to greater brightness in fog or snow, or left at normal intensity for ordinary driving.—*Kenneth Holstein, Tracy, Minn.*

Lights underneath theater seats of the type that pop up when unoccupied. As patrons leave and seats fold up, lights would glow dimly, indicating available seats to newcomers.—*Mrs. Michael Fey, New York City.*



A stapler for shirt buttons. When a button comes off, one blip of the fist would fasten another in place with enough play to allow buttoning and unbuttoning. Fine for bachelors. —*Howard P. Fischer, Monaca, Pa.*



A lightweight jack on casters for household use. Something easy for the little wife to handle every time she wants the furniture switched around for cleaning or just plain rearrangement —*Andrew Brennan, Philadelphia.*

A rasping wheel, similar to an emery wheel, that could be mounted on a grinding spindle. A set of these wheels with different surfaces would shape wood rapidly and easily.—*C. L. Stewart, Alabama City, Ala.*

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Is Your Car as Pretty as a Jeep?

"Family Group," a massive sculpture by Henry Moore, sets an appropriate mood for the bodies beautiful of the "8 Automobiles" exhibit at the New York Museum of Modern Art.

The GI's sturdy "sardine can on wheels" is one of eight automotive masterpieces shown at N. Y. Museum of Modern Art.

By Herbert O. Johansen

PS PHOTOS BY HUBERT LUCKETT

A FRIEND of mine had just finished washing and polishing his car as I came along. It was gleaming from grinning grille to flowing fenders. Joining me at the end of his driveway, he beamed like a proud father:

"Boy, she sure is a beauty!"

"That's just your opinion," I said smugly. "The automobile should be viewed as a hollow, rolling sculpture . . ."

"Where did you hear that?" my friend interrupted.

"At the Museum of Modern Art, in New York City, where the true connoisseurs of automobile beauty gather," I said to him.

"You're kidding?"

"No, honest. The Museum of Modern Art picked out eight cars to display like statues." I pulled a glossy catalogue from my pocket. "Didn't you ever stop to think what automobiles really are? Just listen to this." I then read from the Museum's catalogue:

"They have interior spaces corresponding to an outer form, like buildings, but the designer's esthetic purpose is to enclose the functioning parts of an automobile, as well as its passengers, in a package suggesting directed movement along the ground . . . Its successful introduction to an automobile design is generally the result of one or two basic approaches. The first of them is the conception of an automobile as a box resting on wheels . . ."

I paused and looked at my friend's car.

"That's no box on wheels," my friend said indignantly. "What do they consider a beautiful car? A jeep?"

"Don't sneer at the jeep, friend—it's one

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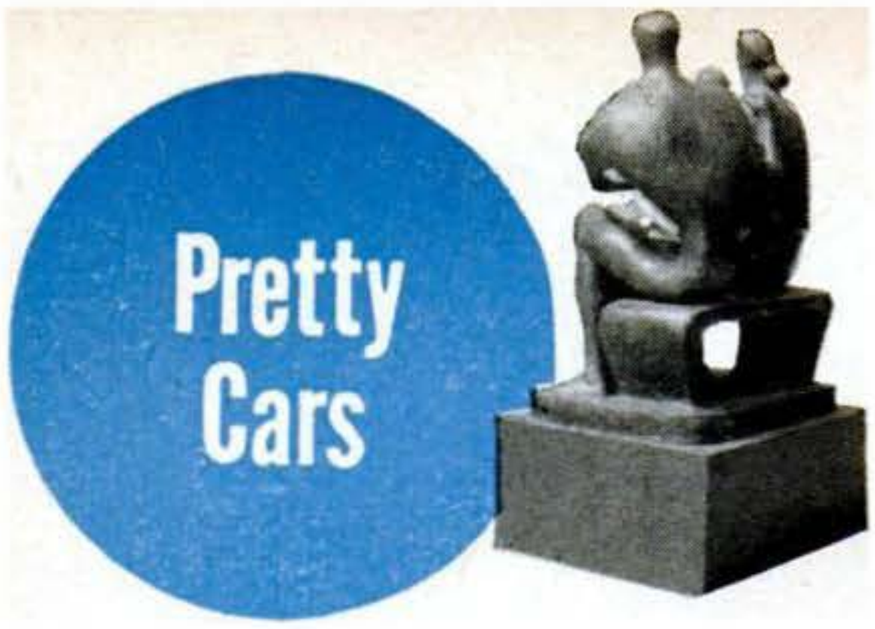


of the chosen eight at the Museum exhibit."

"Oh, my aching back."

"It's the esthetic we're considering," I reminded him, "not your painful memories as a GI driver. Let me quote the Museum on the jeep."

I didn't have to refer to the catalogue. This part I had memorized.

"The admirable jeep seems to have the combined appeal of an intelligent dog and a perfect gadget."

A doglike snort came from my friend.

"The jeep," I continued reading, *"looks like a tray, or perhaps a sturdy sardine can, on wheels. Part of the top appears to have been cut open and folded up, to serve as a windshield. From it a canvas canopy can be stretched over some metal struts to the back of the car, thus affording temporary shelter from the rain. Large wheels dominate the design, and insist rather than suggest that the jeep's primary purpose is transportation."*

"Maybe the guy's got something there," my friend admitted as I paused. "Except for keeping the rain out . . ."

Jeep Is Machine Art

To answer his point, I read on: *"Those who have used the jeep will recall certain limitations of comfort."*

"Oh, brother! . . . But what makes it beautiful?"

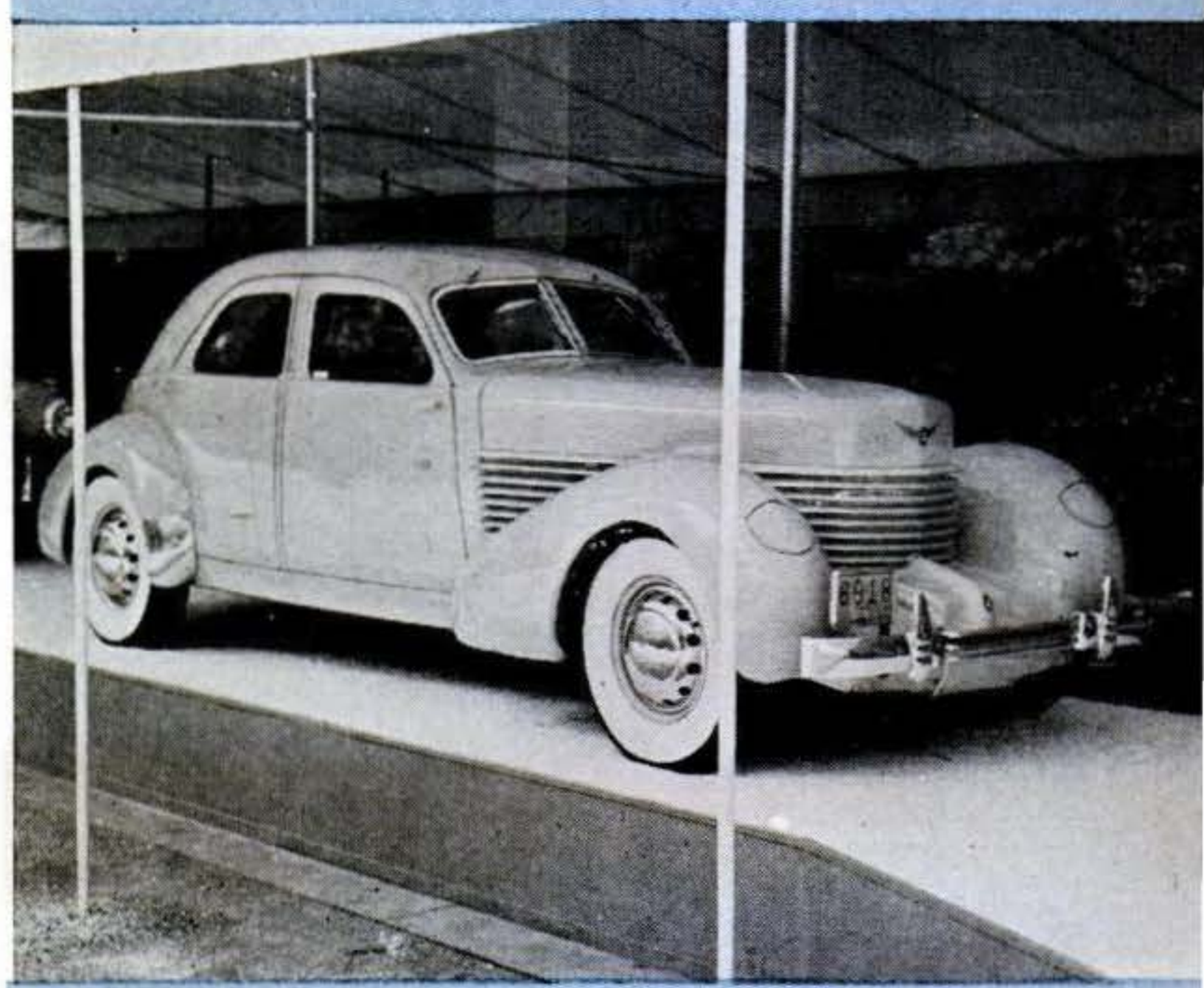
"Beauty, my friend, takes many forms. The jeep, and I quote, *is one of the few genuine expressions of machine art.* And here's another example of machine art." I turned a few pages of the catalogue and pointed to photos of another car beautiful enough to stand alongside the Museum's statues.

"I know that one," said my friend, "the British MG. It's cute and a lot better looking than the jeep."

"Precisely. Here is the critique: *The MG gives the illusion of being the unenhanced piece of machinery which the jeep actually is. Unlike the jeep, however, the MG's stylistic understatement is the result*

Cisitalia, 1949, Italian. A single-envelope design. The grille is a mod fied cross section of the hood. Wheels are decorated with slotted, chromium-plated disks.

Bentley, 1939, British. Characteristics of this car are its sharp, clearly defined edges and a trunk that appears to have pushed its way through the tonneau.



Cord, 1937, American. Here the designer has contrasted a coffin-shaped hood with massive, streamlined fenders. Another feature is grille extending along the sides.

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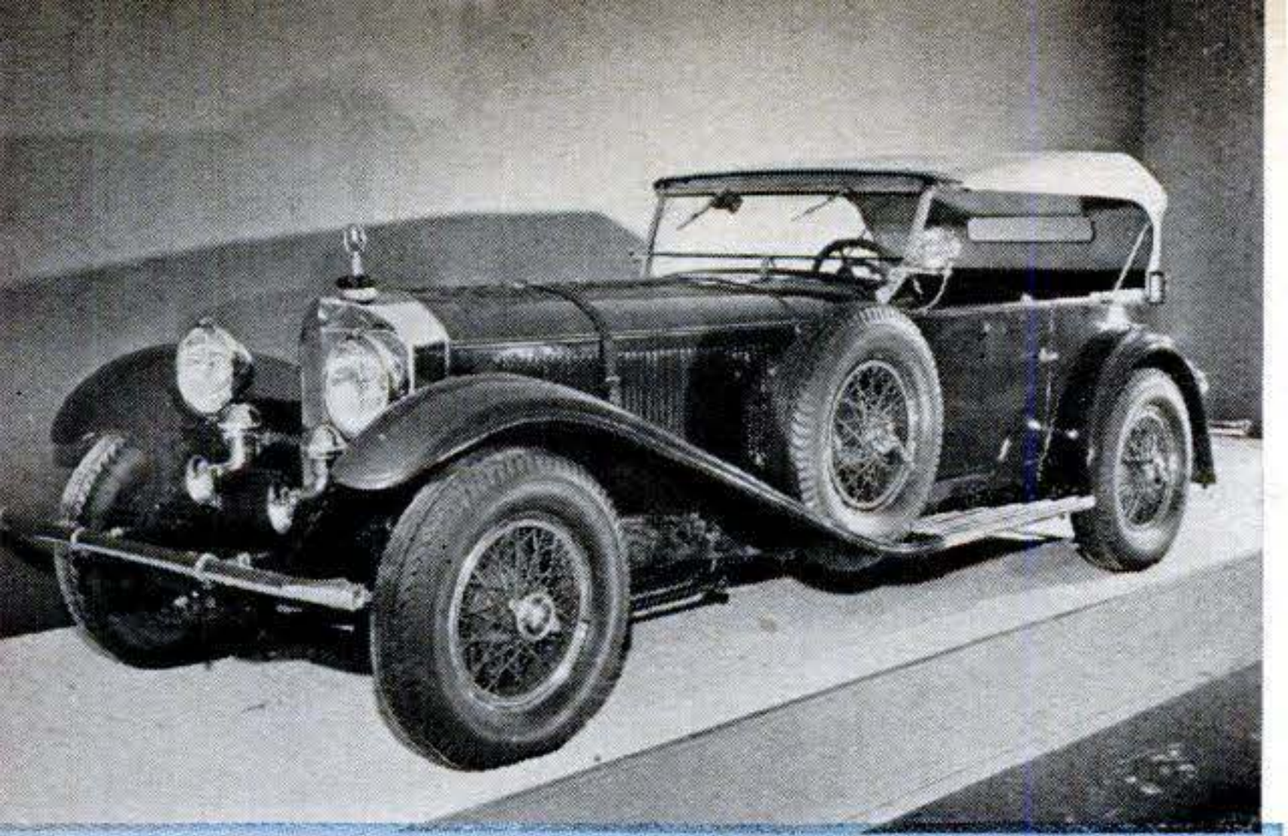
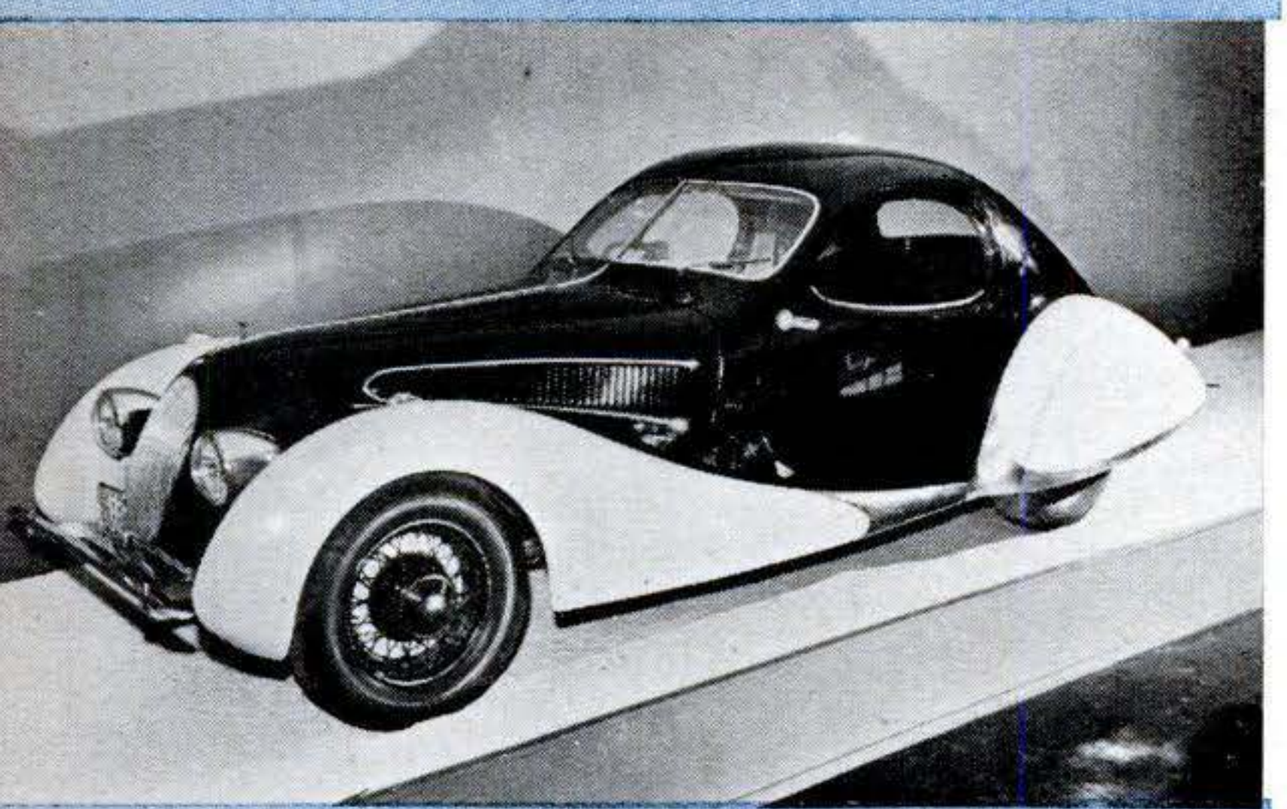
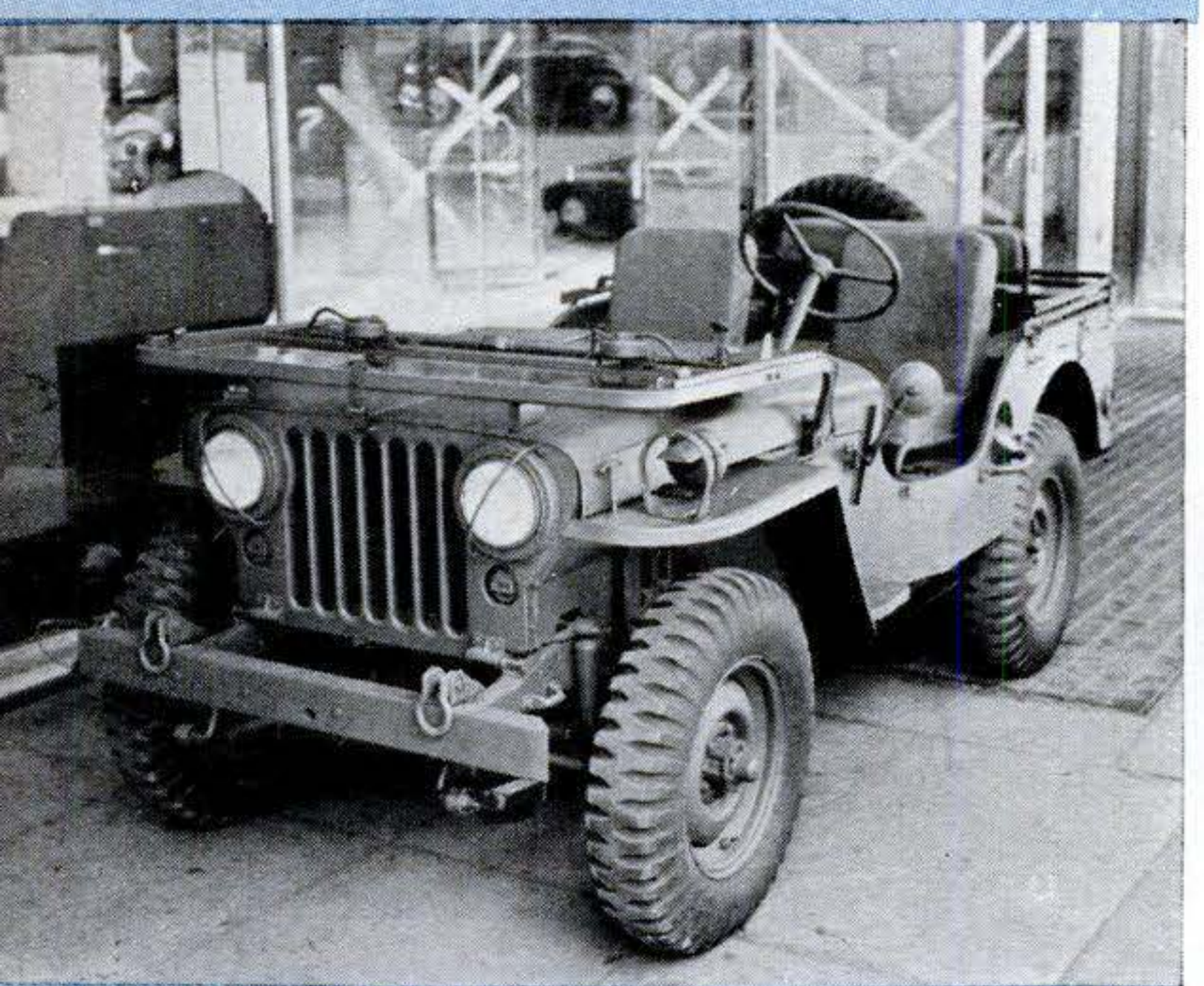


Mercedes, Model SS, 1930, German. The classic box on wheels. Big engine is placed well behind front wheels for proper weight distribution and steering performance.



Talbot, 1939, French. Several envelopes are combined in this car. Front and rear fenders, connected to each other at the base line, seem to cradle the passenger compartment.



Jeep, 1951, American. Engineered as a tool for transportation, design grew out of practical considerations, even to rounded fender corners to prevent cutting passengers.

of an intense but devious preoccupation with appearance. Its designers have chosen simply to elaborate the look of a machine."

My friend looked a bit baffled. "I still like it," he said, "especially those wire wheels."

"Yes." I quoted: *"The wheels are animated by sparkling wire spokes and extravagantly slender rims, resembling the wooden hoops children play with."*

"Okay, okay," said my friend. "I remember those wire wheels on the old Mercedes." He paused, looking up at his car. "That Mercedes was a beauty, too," he added.

"You're in the groove," I told him, turning the catalogue pages to photos of the Mercedes.

"What a hunk of car!" he said admiringly. "How does it stack up in this art lingo?"

Mercedes Is "Amusingly Solemn"

"The designer of the Mercedes," I read, *"regards an automobile as four enormous wheels carrying a box. No detail relaxes for a moment its authoritative carriage, no intransigeant decoration mollifies its stern purposefulness; but for all that, the Mercedes combines an extravagance of metal with quantities of hardware in an amusingly solemn piece of stagecraft."*

I turned a couple of pages. "And here's another box, the Bentley—but *with each side clearly defined and limited by a sharp edge,* it says here. *Attention is thereby focused on the intersections of surfaces, rather than on the surfaces themselves. The intersections produce the Bentley's characteristic swift and precise contour—the famous razor edge."*

"I see what they mean—about the razor edge," said my friend. "But what's that car you skipped between the Mercedes and the Bentley?"

"That's the Italian Cisitalia," I said, turning a page. "And here we get a different art approach. *It minimizes the distinction between separate parts by enclosing them all in a single metal shell.* Anyway, that's how Arthur Drexler—he's Curator of Architecture at the Museum—puts it."

"Streamlining?" my friend said brightly.

"Well, an envelope—an envelope that covers box and parts. Here's what it says:

"The second approach emphasizes the idea of light, unencumbered movement. In its ideal version the type appears to be a single envelope covering passengers and motor as well as accessory parts. Modeling the en-

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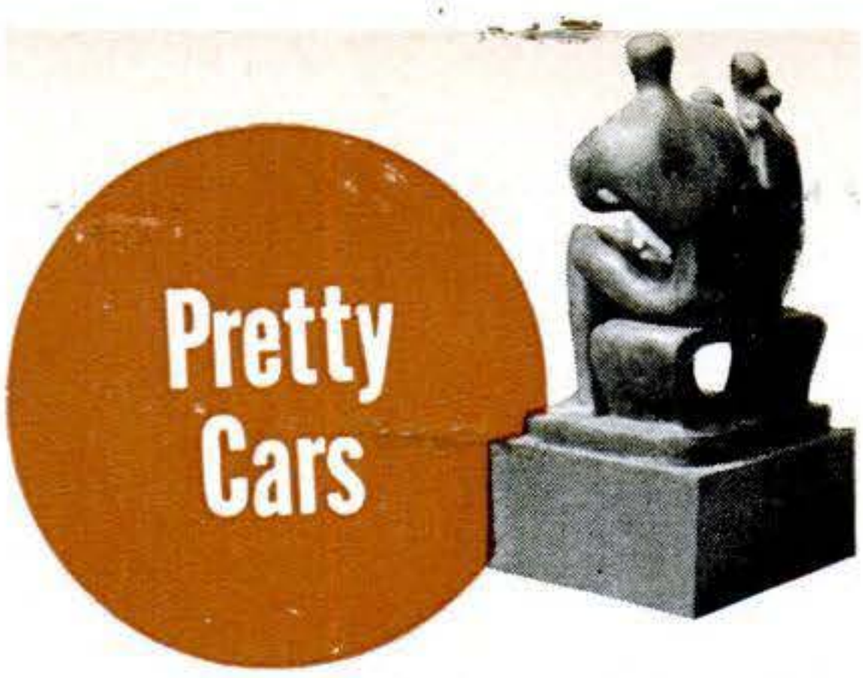


velope as though it were sculpture helps to indicate what has been covered. In this way surface undulations are used to describe the wheels (which may no longer be visible) or to provide a setting for lights, these mechanisms often being held within the envelope as an eye is contained in one's head."

My friend took the catalogue, thumbed through it, and pointed to the French Talbot. "What about this one?"

"Ah, the Talbot," I said knowingly. *"Unlike the Cisitalia, which has a single envelope slipped over its chassis, the Talbot has several envelopes that require only minor punctuation."*

"Too fancy for me," was my friend's only comment. Then, "Look, here's the Cord. I don't wonder they picked that one. And if that's a box on wheels, I like it."

"So does Arthur Drexler. He and the Museum director, Philip C. Johnson, picked the cars for the '8 Automobiles' exhibit."

"Let's see what they say about the Cord."

I had this down pat, too. *"The designer may choose a basic box shape for the major part of an automobile, and relate it to shapes of different sculptural character. The Cord combines balloon-like fenders with a deliberately contrasting squared body. What all the parts have in common are rounded corners to blunt and soften the intersection of planes."*

"I guess that's good then," said my friend. "Any more American cars?"

"Here's the Lincoln Continental."

My friend grabbed the catalogue. "Oh, boy!" he exclaimed. "Wait'll I tell the old man his car made the Art Museum. And look what it says: *The Lincoln Continental satisfies the requirements of connoisseurs while capturing the imagination of a public less preoccupied with the refinements of automobile design.* He'll have a fit when he reads that."

What Makes a Connoisseur?

"Why?"

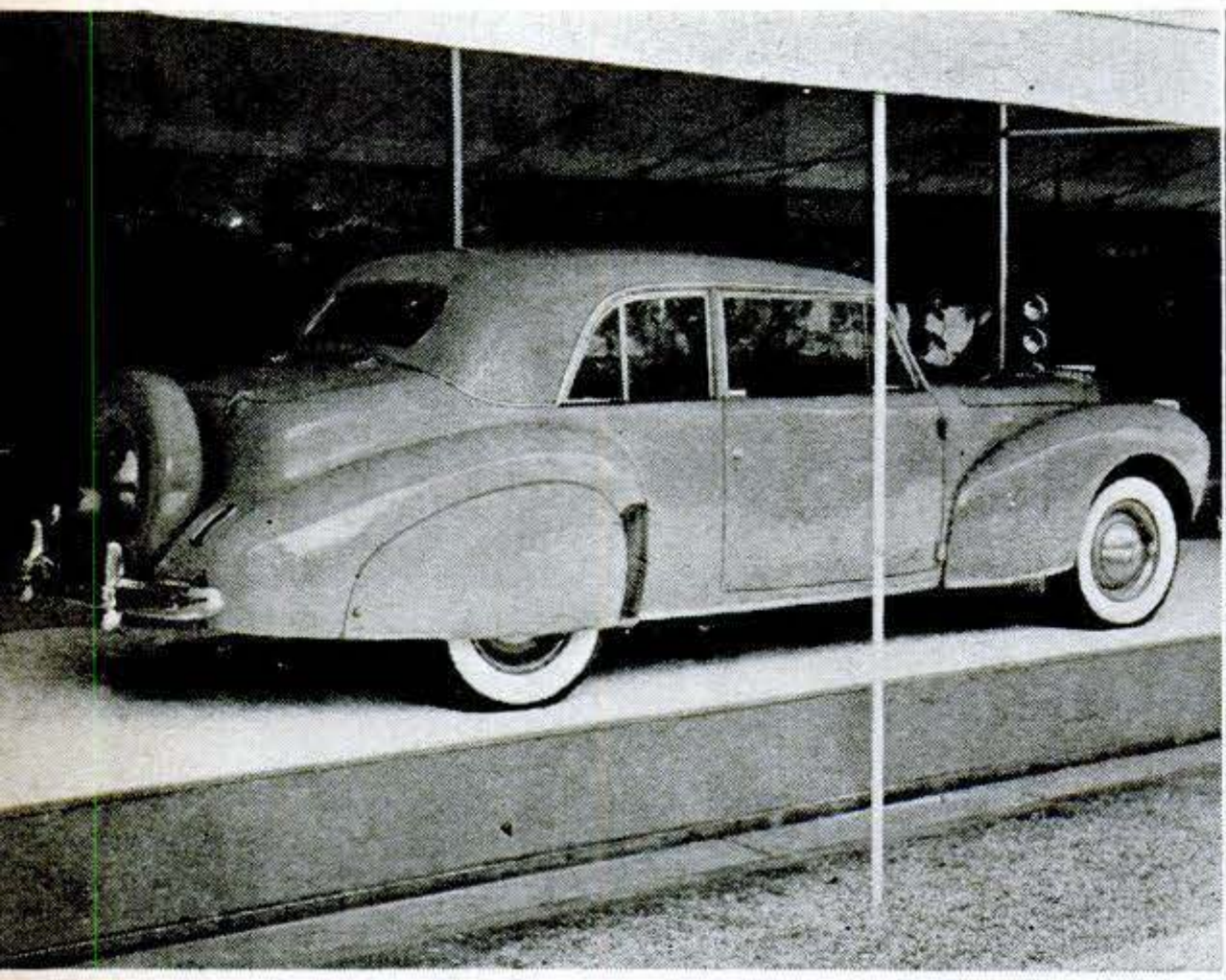
"Well, he won't know whether he's a connoisseur or just the public."

"That may be just the point of this whole exhibit," I said. "Maybe it will help both the public and car designers to become connoisseurs—pay more attention to principles of design. Take yourself, for instance. Now that you've seen the 'Beautiful 8,' what do you think of your car—honestly?"

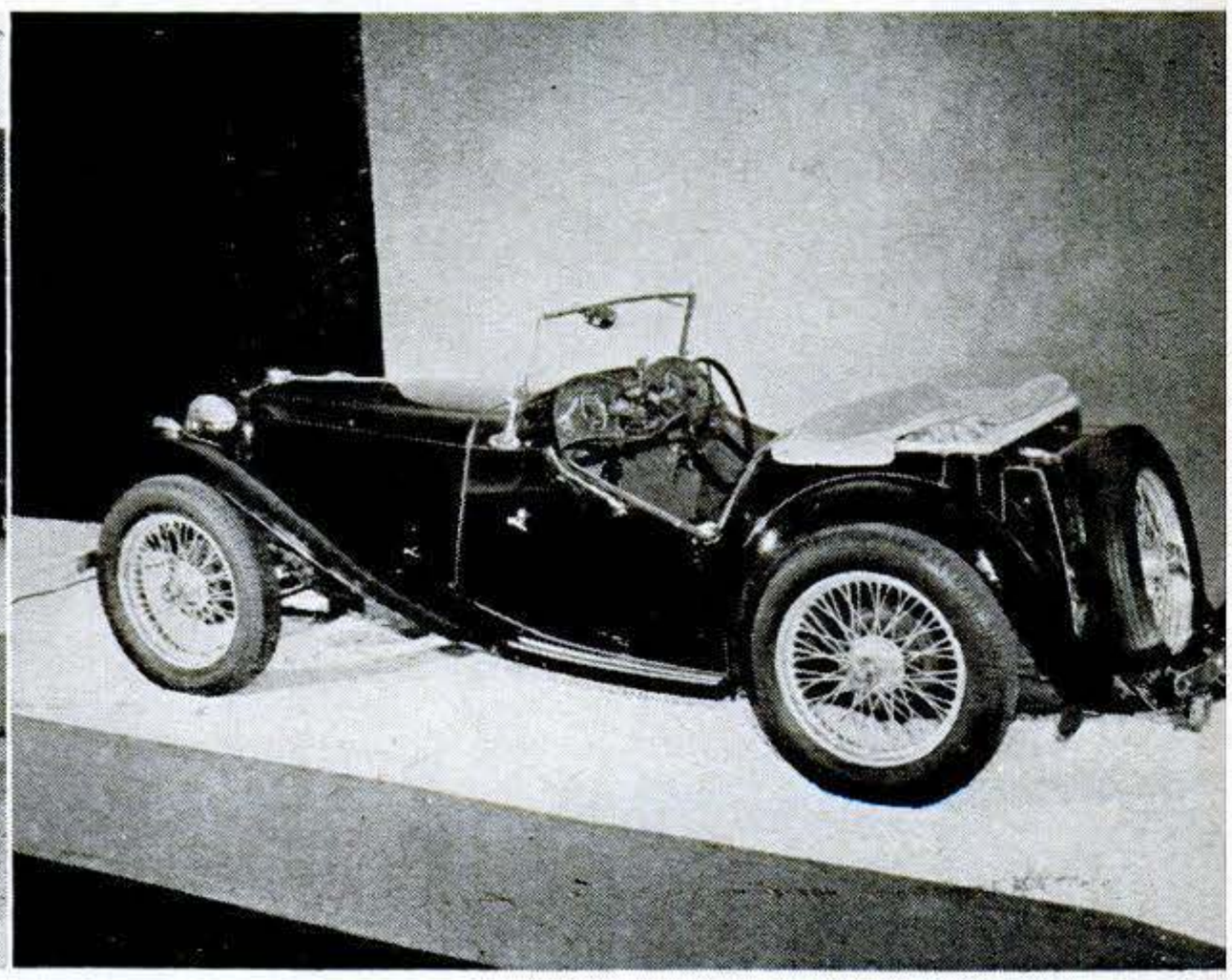
My friend stood back in the driveway, looked at his car with the squint of an artist absorbing the esthetic lines of Venus de Milo.

"Boy, she sure is a beauty!" END

Lincoln Continental, 1941, American. Like the Cord, a box to which fenders have been added. Instead of contrasting, however, front fenders are kept flat and tight to the sides.



MG, Model TC, 1948, British. The front and back give the appearance of separate boxes connected by a shallow passenger compartment. Like Mercedes, it has those wire-spoke wheels.



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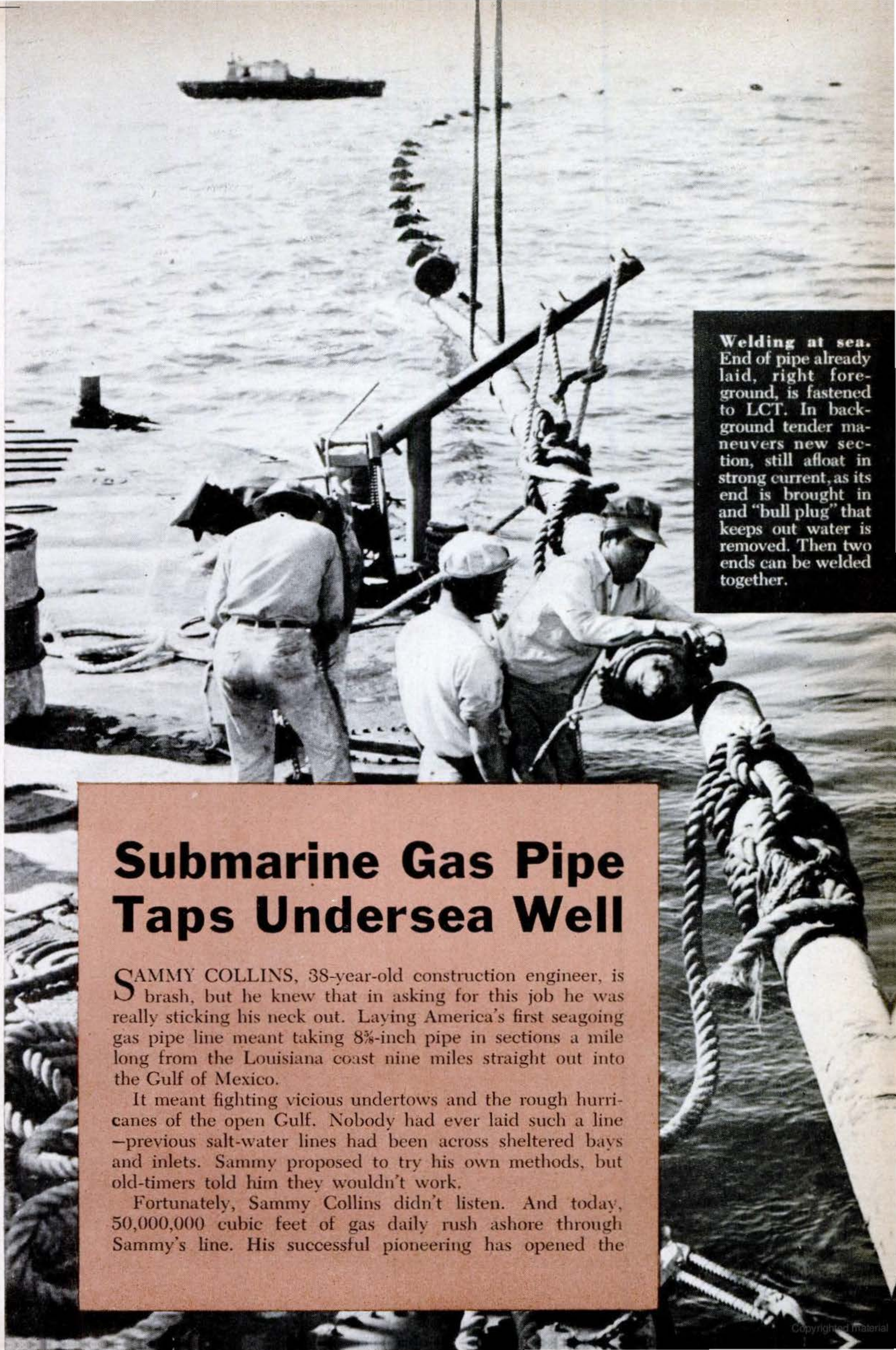

Welding at sea. End of pipe already laid, right foreground, is fastened to LCT. In background tender maneuvers new section, still afloat in strong current, as its end is brought in and "bull plug" that keeps out water is removed. Then two ends can be welded together.

Submarine Gas Pipe Taps Undersea Well

SAMMY COLLINS, 38-year-old construction engineer, is brash, but he knew that in asking for this job he was really sticking his neck out. Laying America's first seagoing gas pipe line meant taking 8⅝-inch pipe in sections a mile long from the Louisiana coast nine miles straight out into the Gulf of Mexico.

It meant fighting vicious undertows and the rough hurricanes of the open Gulf. Nobody had ever laid such a line —previous salt-water lines had been across sheltered bays and inlets. Sammy proposed to try his own methods, but old-timers told him they wouldn't work.

Fortunately, Sammy Collins didn't listen. And today, 50,000,000 cubic feet of gas daily rush ashore through Sammy's line. His successful pioneering has opened the

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Forty-foot sections of pipe are laid out on beach and welded into 1,100-foot lengths. Empty oil drums are fastened to long sections (left) to float them out into the Gulf.

prospect of tapping the gas reserves that lie under the open waters of the Gulf. There's a lot of gas there—experts estimate that it amounts to 60 percent of the known reserves in the continental United States. And we need it: gas consumption has climbed 50 percent since 1945.

It All Started by Accident

The first line resulted from an accident. The Pure Oil Co. had drilled for oil in water 40 feet deep out in the Gulf—and struck gas. Oil could have been run into tankers from the drilling platform, but not gas. So Pure Oil abandoned the well temporarily. That was Sammy Collins' chance.

Sammy shares the profits and problems of the Collins Construction Co. of Port Lavaca, Texas, with five young associates. They soon found that the pipe-line job meant pioneering all the way. To start with, they had to bulldoze a beach 50 miles from the nearest supply center, build a road for trucks and barge in much of their equipment over sand bars at high tide.

Corrosion presented a major problem: salt water had wreaked havoc with many alongshore pipe lines. To resist it, Robert C. Ledford, a director of the project, devised a new method of covering the pipes. First he put on alternate layers of plasticized enamel and glass fibers, then wrapped it with 70-pound Kraft paper. That worked.

On the beach, the 8⅝-inch pipe was welded into sections as long as three city blocks. When the first section was finished, it was placed on a runway, roped to a tug and towed into the Gulf, floating along on water wings made from empty oil drums. As the back end neared the water's edge, another section of pipe was welded onto it. The longest section that could be towed safely was a little more than a mile in length. One by one these sections had to be laid in place and anchored while the next one was welded on. A war-surplus LCT served as a floating welding platform.

Sleepless Crews Battle Storm

It sounds simple on paper. But Collins faced an offshore current so swift that a tug could make only a mile an hour against it. And he soon found that this part of the Gulf is rightly notorious for its vicious squalls. Rough weather plagued the project. One day a storm caught the tug puff-

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Underwater pipe-line trencher, Collins' own invention, sinks to bottom where it will run along pipe, blasting trench in bottom with powerful water jets. Pipe will settle into trench.

ing along with a tail of 5,600 feet of heavy pipe. Through fast work, the LCT hooked onto the head of the line while the tug shifted to the rear. They headed into a gale. For four days and nights the sleep-starved crews fought to keep the pipe line from breaking to pieces.

Sinking Pipe Outwits Barnacles

Even in calm weather, fitting two ends together for a weld at sea was a mean job. It took three days to out-fight the currents and maneuver the unwieldy mile-long sections of pipe into position for one weld. Work began at four A. M. and lasted until 10 or 11 at night.

Barnacles had been a major problem for previous submarine-pipe layers. These tiny shellfish had cut not only through the best pipe coverings, but into the pipes themselves. Now Collins pulled out his secret weapon. Barnacles cannot live underground, so Sammy decided to bury the pipe line.

For 15 years Sammy had experimented with a trench digger using high-pressure water jets. He could never get his jet digger to work properly on land, but it proved just the thing for underwater use. Fastened around the submerged pipe line, the device aims a series of nozzles at the sea bottom. Then as it is propelled along the pipe, it shoots powerful streams of water into the mud, scooping out a ditch four or five feet deep. The pipe sinks into the ditch, and much of the whirling mud blasted loose by the jets settles back, burying it.

Spies Snoop Secrets

Sammy zealously guards the technical details of his jet trencher and the other mechanical devices he invented for underwater pipe-line work. One man on the project was discharged because Sammy suspected him of spying for a rival concern. Planes, obviously taking movies, flew low over the project several times.

Collins worked at almost every job connected with pipe-lining before he went into construction with his own company. Now he has been plunged into big business by the successful completion of the seagoing line. All kinds of underwater pipe-line problems are dumped on his desk. Three machine shops work full-time turning out equipment for his projects. Collins is one man who has gone up by going down. END

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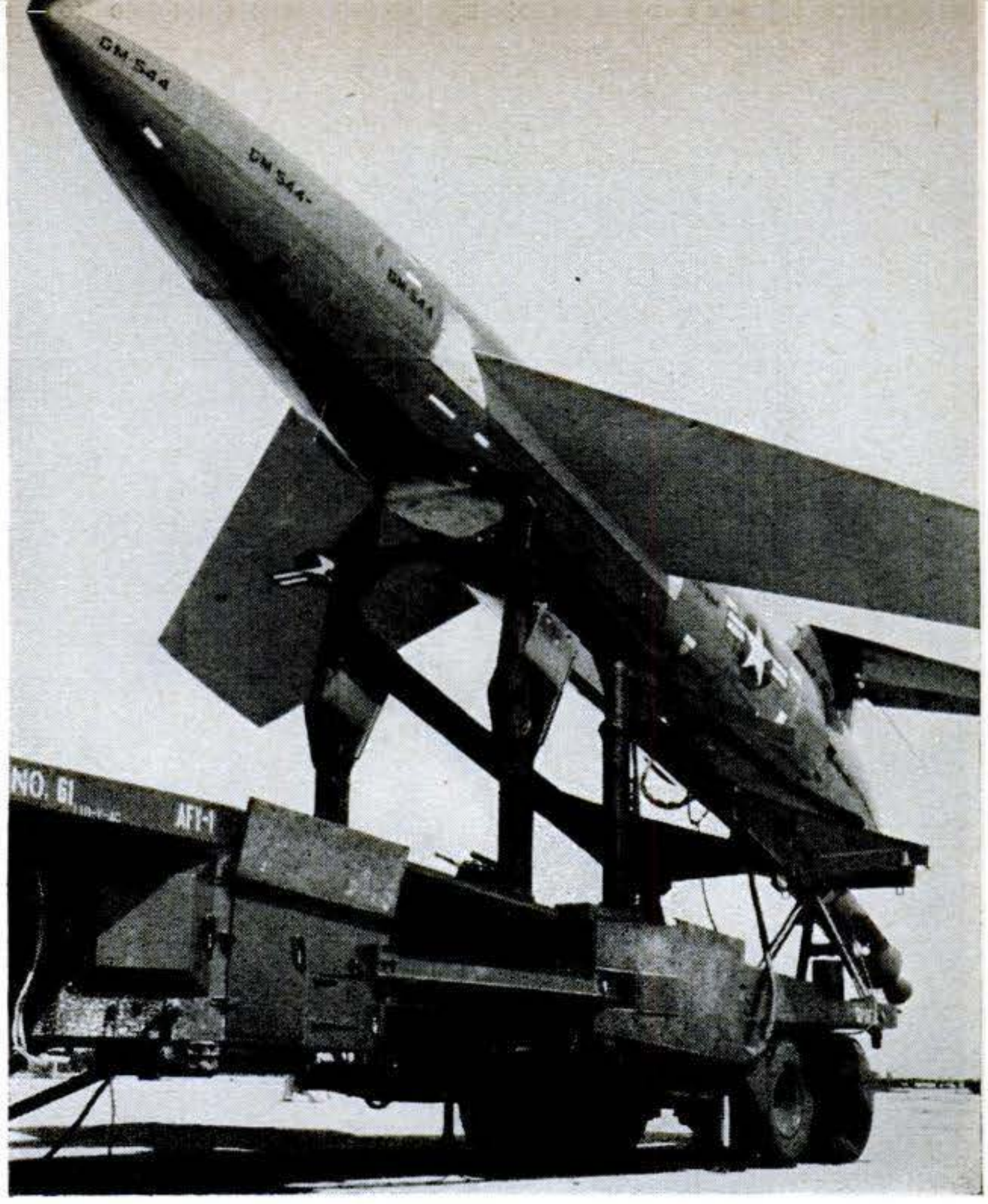
Pilotless Bomber Can Carry A-Bomb at 700 M.P.H.

THESE pictures document a big step toward push-button war. They show the launching and flight of America's hitherto secret B-61—nicknamed the Matador—a pilotless jet big enough to carry an atomic warhead. In taking the wraps off it, the Air Force also announced formation of its first pilotless-bomber squadron, which will soon start training with the new tactical weapon.

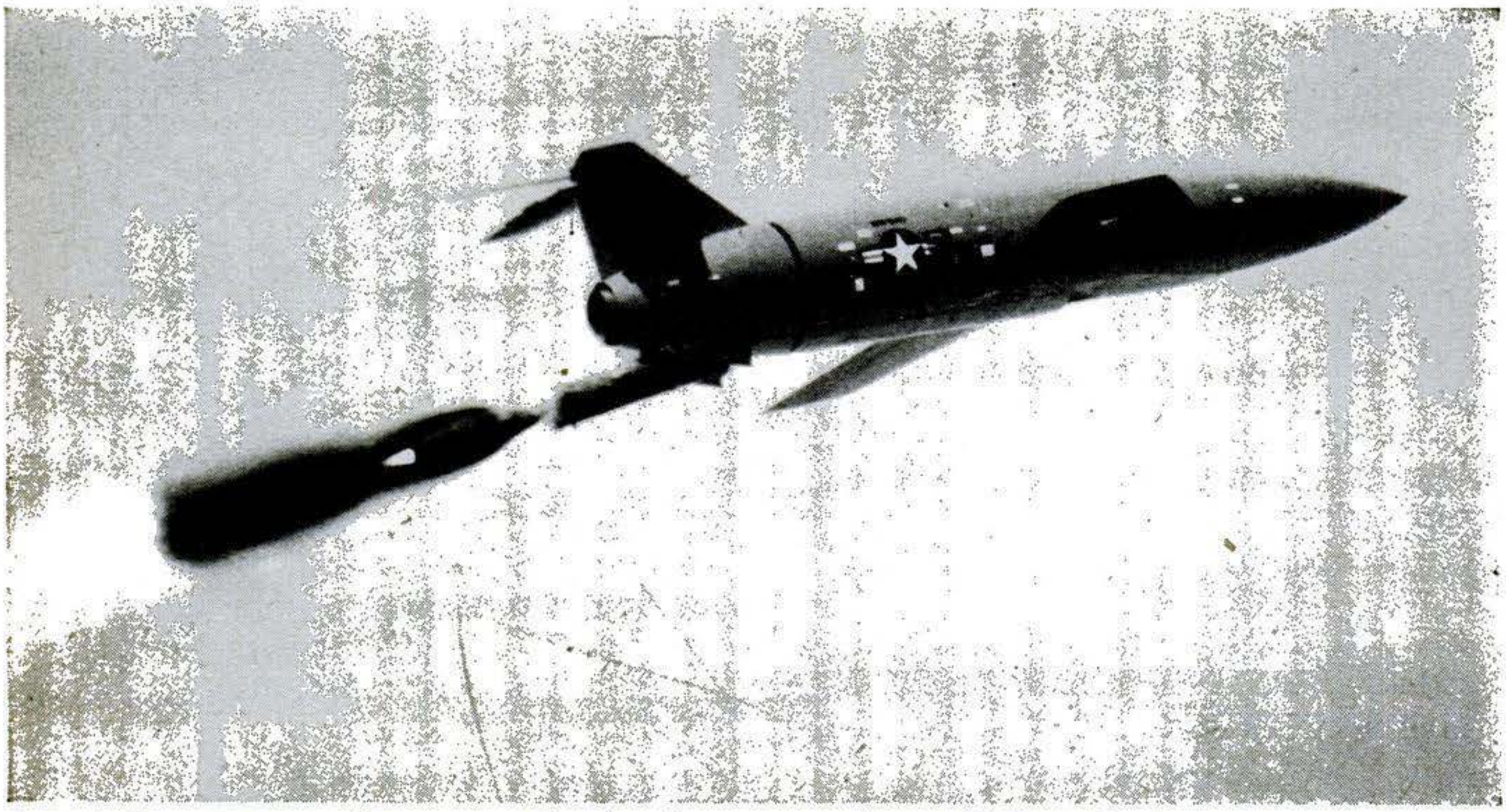
The Matador, made by the Glenn L. Martin Co. of Baltimore, is guided by radio to its target at around 700 miles an hour. No known jet fighter could catch it and shoot it down. And, having no crew, it would not have to fly at high altitude to escape the A-bomb's terrific blast.

The guided missile's range, however, is limited by the reach of its controlling ground radio—probably a few hundred miles. This might be extended by guiding it from a "mother" plane, which could stand off at a safe distance while the missile closed on its target.



Matador awaits take-off from its launcher.

The First Pilotless Bomber Squadron (Light), equipped with B-61's, was activated last month at the Air Force's Missile Test Center in Cocoa, Fla. Later it will work under the Tactical Air Command. Its formation followed reports that the U. S. has developed a small A-bomb suited to use against armies in the field.



As missile gains speed, spent rocket bottle starts to drop off. Note fat body and needle nose.

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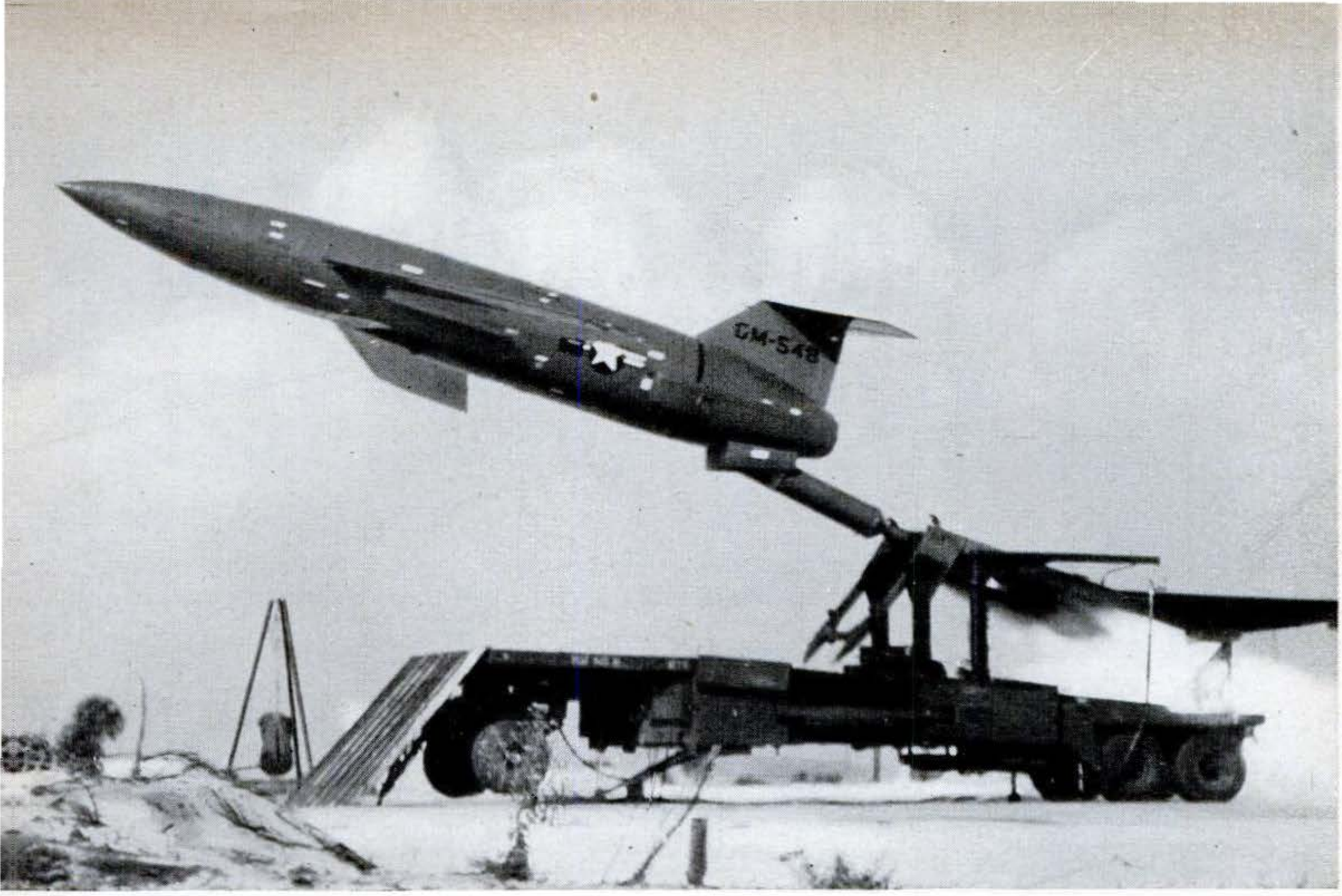
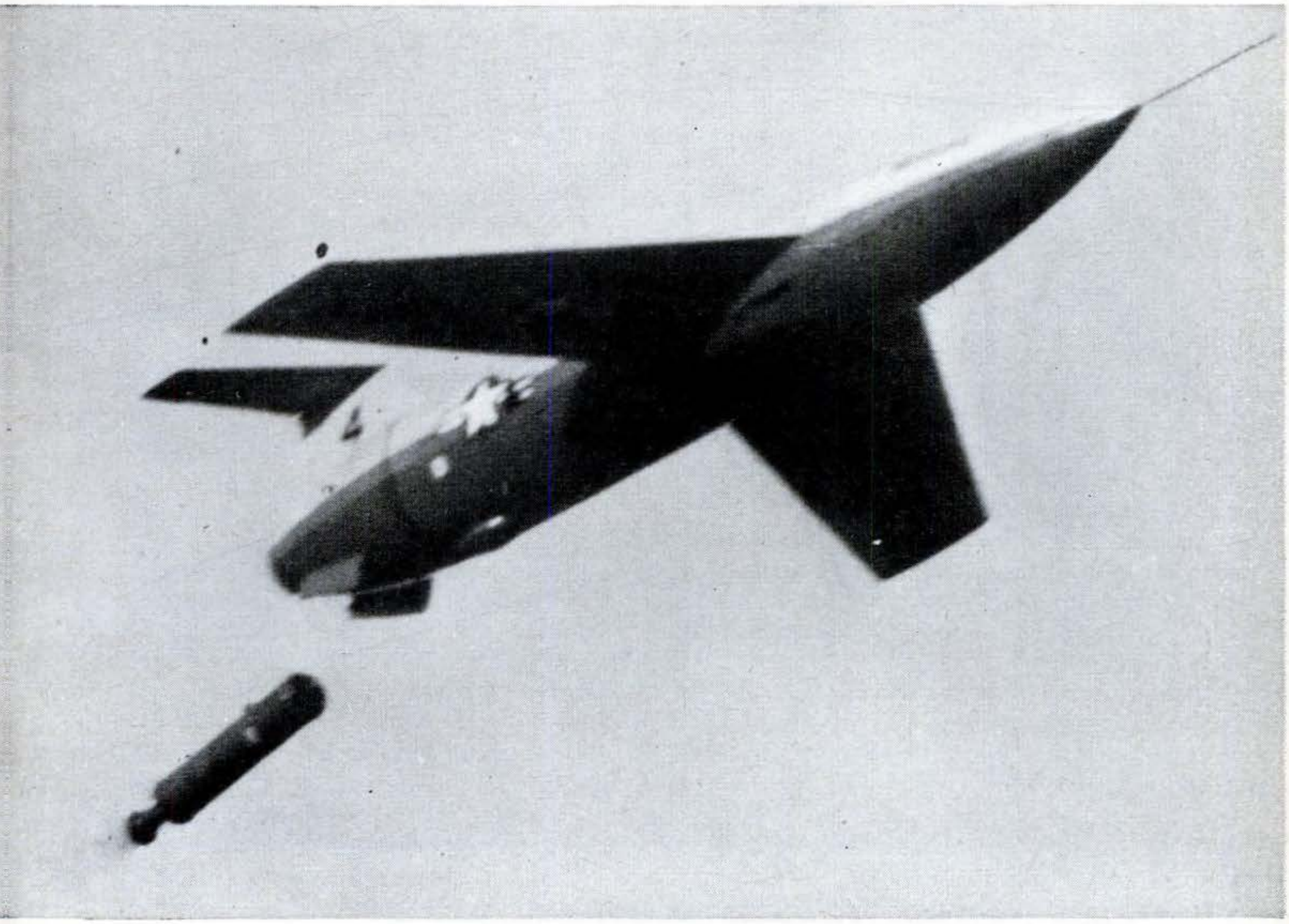


Missile leaves ramp in fiery blast from auxiliary booster rocket slung underneath its tail.



As booster rocket falls off, jet takes over, and missile speeds to keep date with destruction.

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Parking Meters Yield $50,000,000 a Year

Irate motorists have tried to chop them down, jam them with gum, fool them with slugs. Yet their number grows.

By DeWitt Reddick

IN THE short space of 15 years the parking meter has swept the continent to become an American institution. Meters now confront the motorist in 90 percent of U. S. cities above 50,000 in population, and yield an annual income of approximately $50,000,000 to city governments. At a nickel an hour, the standard rate, this means that American drivers are buying more than 1,000 million hours a year for parking.

The parking-meter business is a postwar baby. Now the industry spreads an annual sale of about $15,000,000 among six major companies and a few minor ones. Competition is rough, and the industry still struggles with problems uniquely its own.

"Vigilantes" Arrive with Axes

For instance, few industries face such sharp resentment from the people they aim to serve. It has been almost universally true—and still is—that the first wave of parking meters installed in a town arouses citizens to impressive wrath.

In Mobile, when meters were installed in 1935 on a trial basis, a "vigilante" committee showed up with axes to chop them down. Carthage, Tex., city officials agreed to install meters in the business section; but when the crew began to put them around the courthouse the sheriff chased them away with a shotgun. And one indignant motorist in North Dakota got an aroused public to outlaw meters in 1948. They were made legal again this year. Undaunted, the angry man has secured 10,000 signatures to a petition to outlaw them again.

After the initial shock most communities accept the meters as an inevitable sign of progress. By now approximately one million meters have been installed in 2,500 cities. Installations range from Culpepper, Va., which started with 12 meters, to Chicago, with 15,000. New York City has just installed some on a trial basis. Geographically, they spread from Brownsville, Tex., to Fairbanks, Alaska.

A city does not have to spend money to install meters. If the city agrees to try them out, the parking-meter company sends a crew to sink holes through the sidewalks and do all the other work. Then comes a six months' trial period. The city gets half the revenue and the other half goes in payment on the meters, which retail (according to make) from $60 to $75 each. At the end of the trial period the city decides whether or not to keep the meters. If the decision is no, the city keeps its half of the revenue already collected, while the company must remove the meters and repair the sidewalks.

Local Parkers Grab Places

The parking meter was invented to help solve the traffic snarl which constitutes a major problem for most cities. Surveys in the 1930s indicated that a major proportion of downtown parking space was filled with cars of those who worked in the vicinity. Little space was left for customers. Likewise it was shown that the same cars remained parked all day, despite one-hour parking zones. A wet cloth quickly removed chalk marks used by a passing policeman to check parked cars. Regular checkups were difficult to maintain. Busi-

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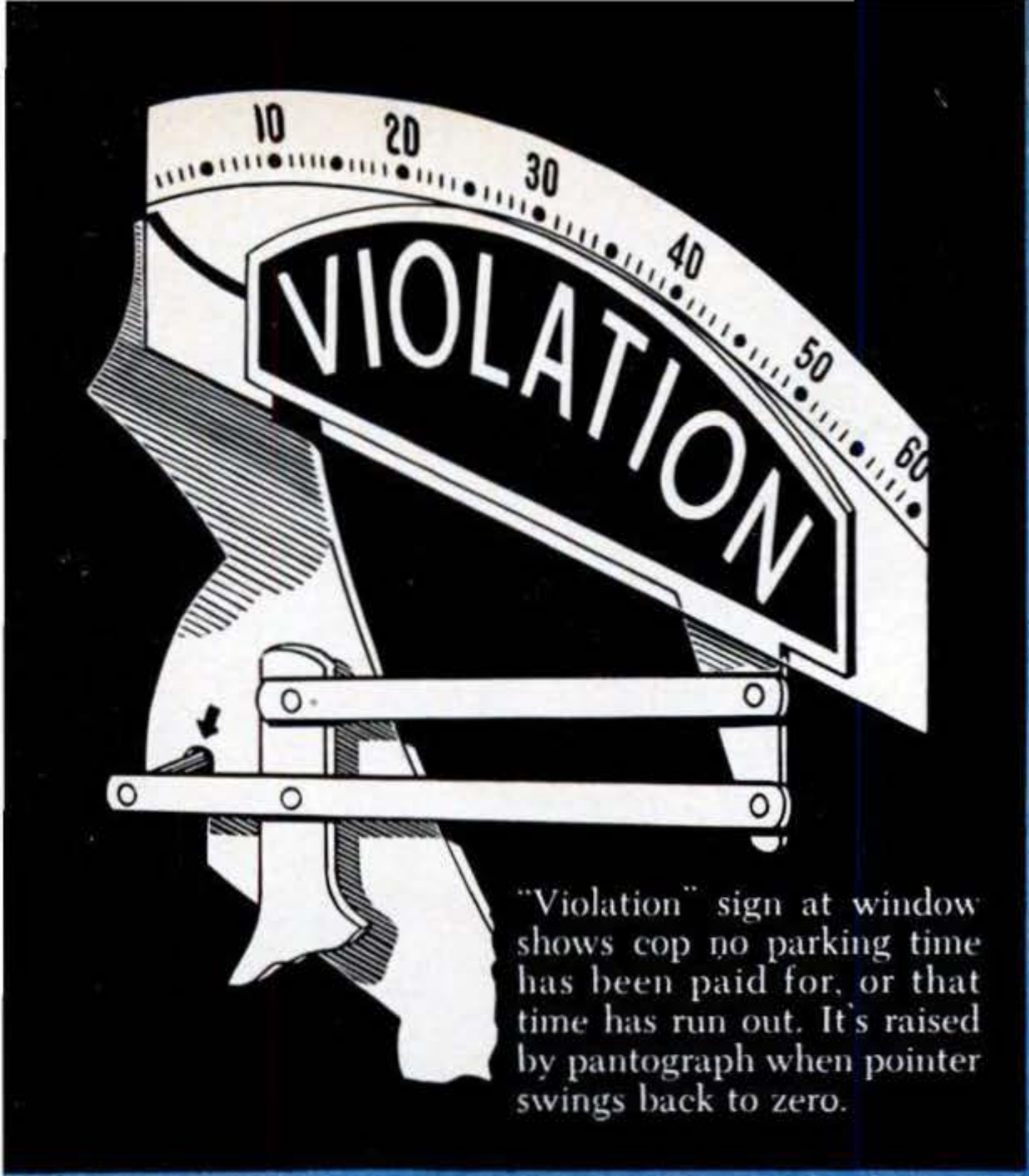
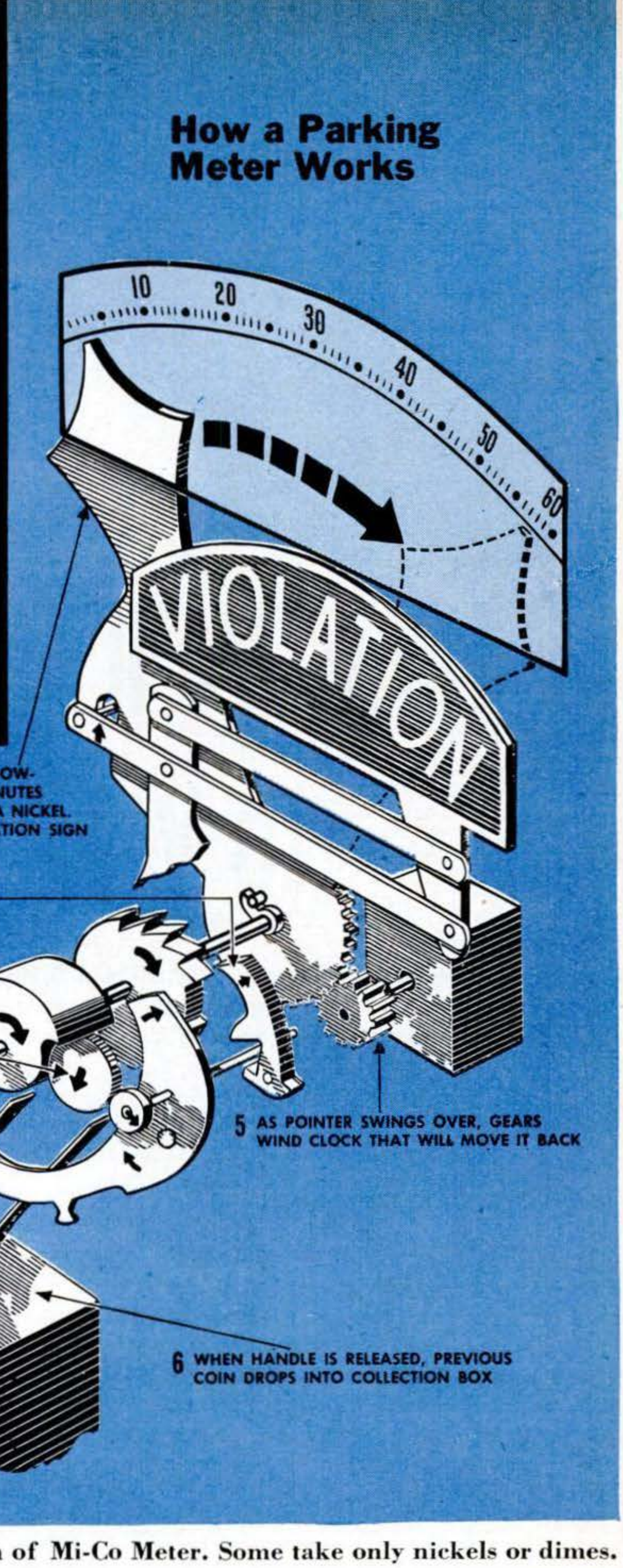


"Violation" sign at window shows cop no parking time has been paid for, or that time has run out. It's raised by pantograph when pointer swings back to zero.



How meter gulps money is shown in sketch of Mi-Co Meter. Some take only nickels or dimes.

ness flowed to suburban shopping centers.

Parking meters, while not the entire answer, have afforded notable relief. After installation of meters, Washington, D. C., reported parking turnover at least 25 percent greater. Dallas surveys showed four times the number of motorists using downtown parking space as before the meters. Wilmington, Del., officials stated: "There are only 440 parking meters in Wilmington's central business district, but 5,500 cars park daily in the metered area."

Carl W. Magee, then editor of the Oklahoma City *Daily News*, is credited with originating the idea for the present form of parking meter. In the late 1920s, when he was a member of the traffic committee

[Continued on page 294]

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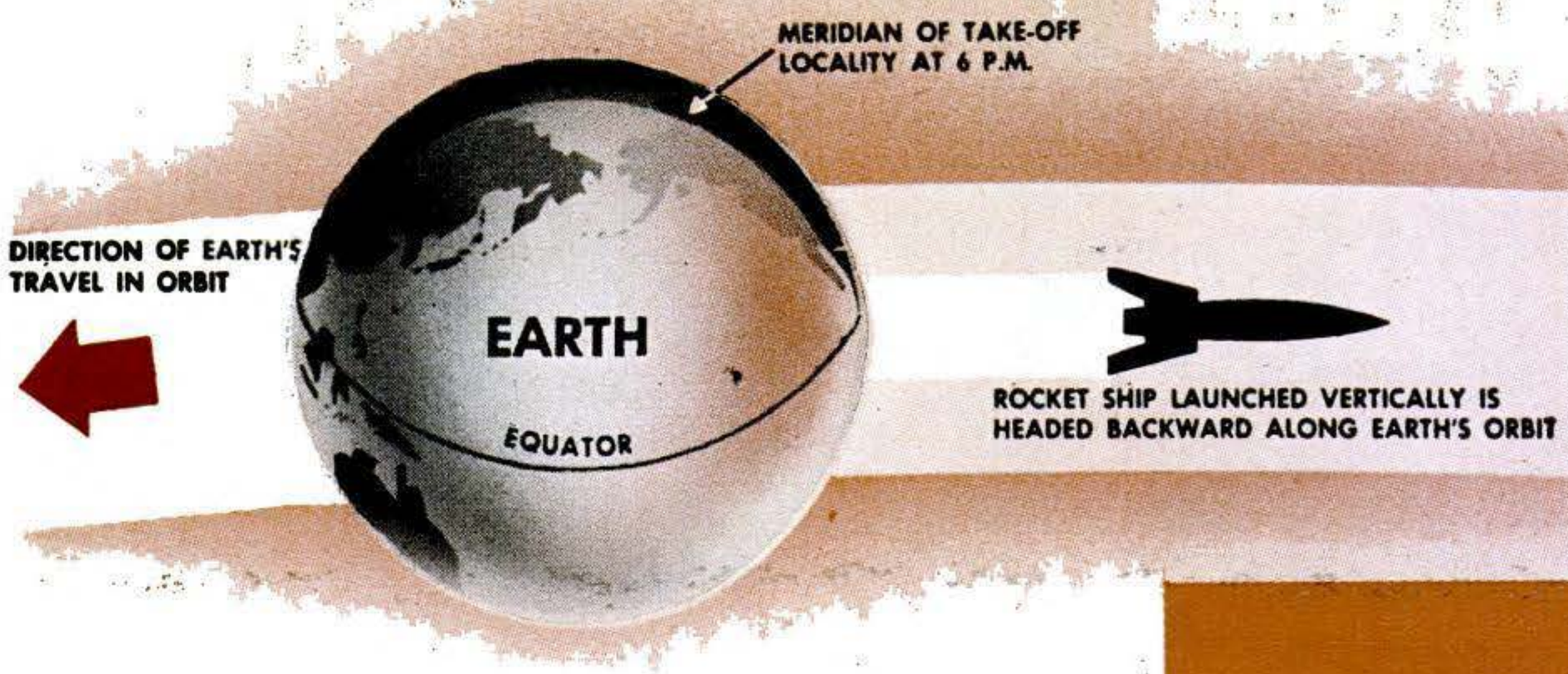
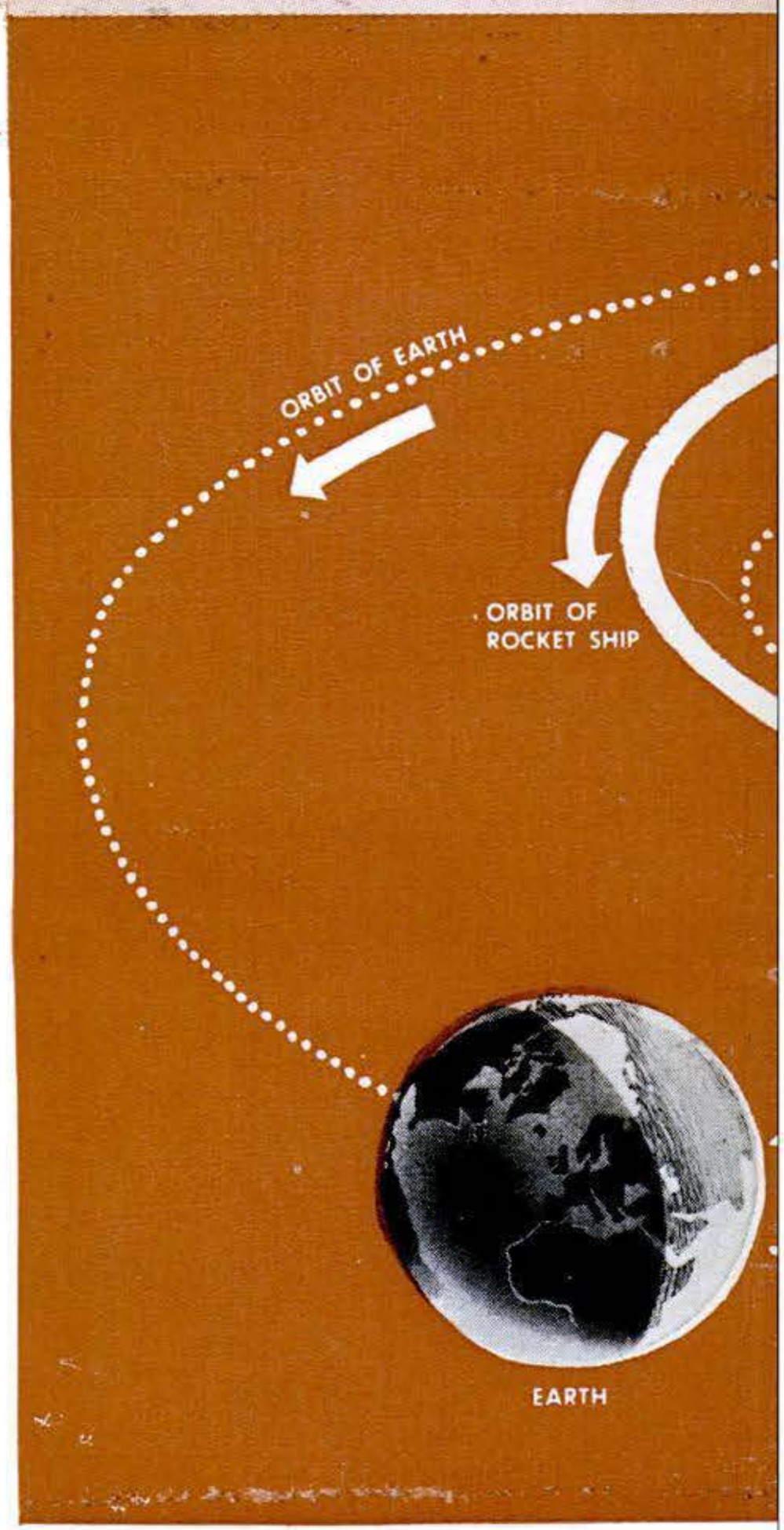


How We'll Fly to Venus



An aviation engineer submits a flight plan for navigating a spaceship to our nearest neighbor among the planets.

THE first flight to Venus will depart from Earth shortly before 6 P. M.

The date has not been set. It could not be revealed now, even if it were known, because it would indicate how rapidly guided missiles are being improved.

But the time of day can be forecast.

John M. Wuerth, an engineer in North American Aviation's electromechanical department at Downey, Calif., has done so by working out the navigational problem which the first men to fly to Venus will have to solve. He has submitted a "flight plan to Venus" to the Institute of Navigation.

Venus comes closer to the Earth than any other planet, so it is likely to be the first one that men will try to visit. At times, it is only 25,000,000 miles away. (Mars is always at least 35,000,000 miles away.) Venus, moreover, is a planet that probably could sustain human life. There may, in fact, be living creatures on it now.

In ordinary navigation, you determine your position by shooting the stars and correct your course as you go along. But getting to Venus from the Earth will be like being shot out of a gun.

The Start Is All-Important

Once your rocket ship is well out into space, you will not be able to change your course whenever you please. Your steering will have to be done during the first few minutes of the voyage. For rocket fuel, precious because of limited carrying capacity, will be expended only for taking off and landing.

Motive power for the major part of the

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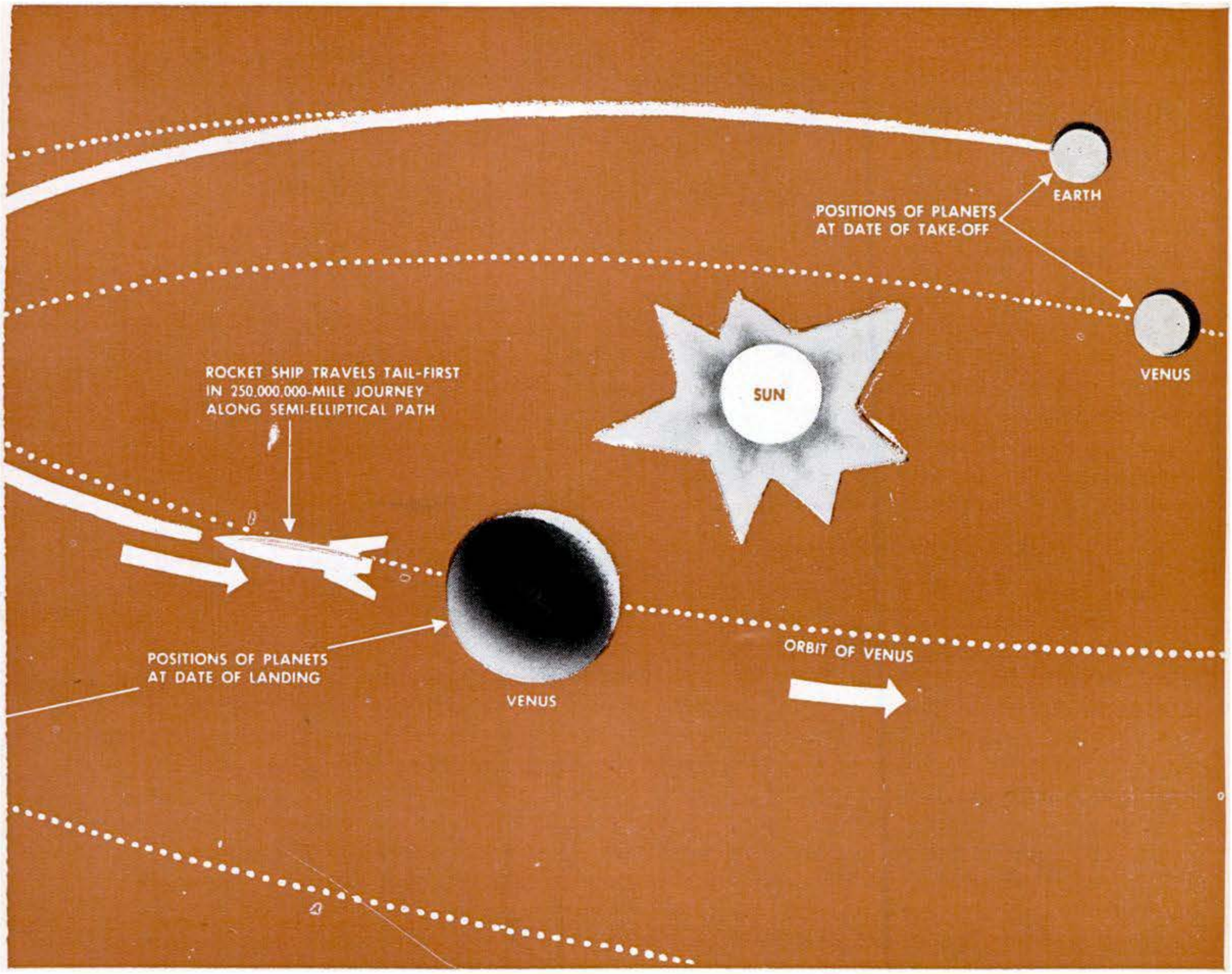
Here are highlights of the way a rocket spaceship could be navigated from Earth to Venus. Take-off from Earth at about six P.M., left, would head ship in desired direction—backward along Earth's orbit. Ship would still be tagging after Earth, tail-first and at slower speed. Result is seen in larger view below. Pull of sun's gravity would draw ship into semi-elliptical path toward orbit of Venus, which would be reached in 146 days. Meanwhile Venus would have traveled in its own orbit more than halfway around sun. Curving 250,000,000-mile route is more economical of fuel than short, direct one.



journey, as Wuerth sees it, will be furnished by the pull of the sun's gravity. Here is his explanation:

The Earth whizzes along its orbit around the sun at 66,600 m.p.h. At this speed, it is as firmly tethered in space as if it were whirling on a string. The inward pull of the sun's gravity is exactly balanced by the outward pull of centrifugal force. A rocket ship, or any other object, traveling at Earth's speed in Earth's orbit, would likewise stay put there.

Suppose that you fired a 66,600-m.p.h. rocket backward from the Earth along its orbit. This would be like firing a bullet backward from a plane flying forward at the same velocity. The bullet, obviously, would stand still in mid-air, then fall vertically under the pull of gravity.

A rocket fired backward from the Earth at the same velocity as the Earth would stand still similarly, then fall similarly. But in this case the gravity that caused it to fall would be that of the sun, so it would fall toward the sun and thus into the orbit of Venus.

Actually, to hitchhike a ride on the sun's

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Will living Venusians be found by first space travelers from Earth? Grasshopper-like people with jet-propulsion outfits on backs tend a Venusian garden in this fanciful drawing by North American Aviation artist. Scientists say life on planet is possible—and there's virtually nothing to limit imagination as to its form. Clouds hide face of Venus and prevent observation of it.

gravity, a rocket would not have to come to a full stop in space. If the bullet in our analogy had less speed than the plane from which it was shot, it still would fall—but this time, in a curved trajectory. So would a rocket that was traveling back less rapidly than the earth moves forward.

To Escape from Earth

This enables Wuerth to base his plan upon a rocket ship of lower speed, more economical of fuel, than 66,600 m.p.h.

A take-off time of about 6 P. M. will launch it vertically in the right direction. The point of departure will be somewhere along the equator. At that hour and latitude, "up" will be straight back along the Earth's orbit.

For 13 minutes, the rocket he envisages will hurtle straight upward at ever-increasing velocity. In that time it will reach a height of 2,000 miles and a speed of 17,500 m.p.h.—enough, at that altitude, to free it from the apron strings of Mother Earth's gravity.

Venus Will Move, Too

The space crew then will cut off the rocket power, and let the ship coast onward. Although its speed with respect to Earth will drop to 5,400 m.p.h., Wuerth's figures indicate, it will begin to respond to the pull of the sun, leave the Earth's orbit and curve inward toward the orbit of Venus.

It will then glide for 250,000,000 miles on a semi-elliptical course that will lead to Venus. As it advances, the ship will gain speed as a natural consequence of the sun's gravitational attraction—and it will reach Venus 146 days after leaving the Earth.

In this time, almost five months, Venus will have journeyed in its own orbit more than halfway around the sun. Allowance will have been made for this, of course, by choosing a take-off date that will permit the spaceship to reach the orbit of Venus at the right time. Such a favorable relative position of Earth and Venus occurs only once in 19 months—making daily or weekly cruises to Venus unlikely in the foreseeable future.

Preflight plans will also take into account the Earth's rotation upon its own axis. This gives Earth's surface at the equator a tangential velocity of more than 1,000 m.p.h. which will be imparted to the rocket at the time of take-off, in a direction sideward to its desired course. To counteract this effect, Wuerth says, it will be necessary to take off slightly before six P. M.

Aim Depends on Speed

Most critically of all, success in intercepting Venus will depend upon the exact velocity of the accelerating spaceship at the instant of power cutoff.

If this "cutoff velocity" is too high, net orbital speed will be lower than intended. Then the rocket ship will be drawn too rapidly toward the sun and will hit the orbit of Venus too soon, missing connections and passing between Venus and the sun. Conversely, too low a cutoff velocity will result

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in too high a net orbital speed, and the rocket ship will overshoot its mark, again missing connections.

Naval airmen know how it feels to rendezvous with a carrier, the only possible landing place in a vast expanse of inhospitable ocean. Here you will be trying for a touchdown hundreds of millions of miles away. If you're 10 minutes late, you will miss by 13,000 miles.

Near Miss Is Close Enough

Luckily that wouldn't be too serious. If you managed to come within 15,000 miles of Venus, the planet's attraction would deflect the ship in for a landing. But if the ship missed by a wider margin, only some means of turning it toward Venus could save you. Otherwise the planet's gravitational pull would merely fling the ship off into another orbit around the sun, and spell doom for the passengers and crew. The ship would circle in space forever, or until it collided with another planet.

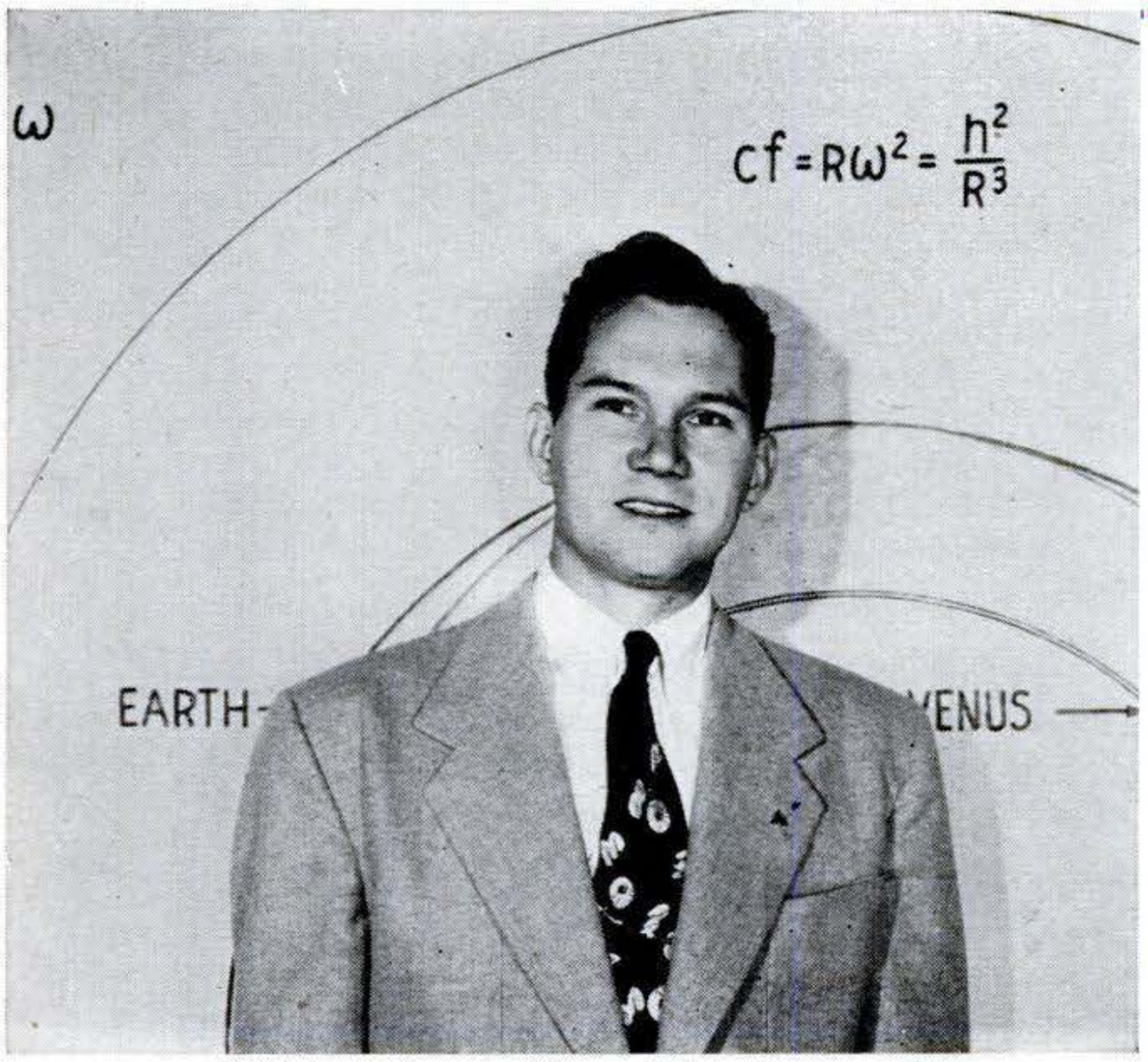
So the most important navigational instrument will be an accelerometer, to measure the rate of speed increase during powered flight. The Germans used one to determine the proper power-cutoff point for their deadly V-2 rocket. To get within the required 15,000 miles of Venus, cutoff speed should be accurate to within .007 percent. With present instruments, inaccurate by as much as .1 percent, a ship could miss Venus by a million miles. But, Wuerth says, "It's not unreasonable to assume that an accelerometer accurate within .0035-percent error will be ready before our take-off."

Getting Home Again

How will the ship land on Venus, and how will you return to Earth? Rocket brakes should ease you down. But to get back home you would need enough fuel for the round trip—and enough food to last until Venus and Earth "lined up" properly for a return voyage.

In returning, you would get the needed boost by taking off in the direction of Venus' orbital travel. Rocket speed would then be added to the planet's, instead of subtracted from it—and the pull of the sun's gravity upon the rocket ship would be exceeded by centrifugal force, which would propel the ship homeward.

Other interplanetary voyages can follow the same principles, Wuerth foresees. Alter the Venus flight plan, for example, by taking off at dawn instead of dusk, and centrifugal force would hurl you into Mars' orbit. You would reach the red planet 237 days later. END



"Flight plan to Venus" in diagram form provides background in this photo of its author, John M. Wuerth, North American Aviation project engineer. Formula gives some of data.

KEY FIGURES IN FLIGHT PLAN TO VENUS

(Data given in round numbers for simplicity)

Orbit of Earth, radius	93,000,000 miles
Orbit of Venus, radius	67,000,000 miles
Distance from Earth to Venus:	
At nearest approach	25,000,000 miles
By semi-elliptical flight path	250,000,000 miles
Orbital speed of Earth	66,600 m.p.h.

PROPOSED FLIGHT SCHEDULE:

Departure time	Shortly before 6 P.M.
Accelerating period:	
Duration	13 minutes
Altitude reached	2,000 miles
Cutoff speed (relative to Earth)	17,500 m.p.h.
Total time for journey to Venus	146 days

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P.S.

Last minute news & notes...

A DETAILED PROPHECY of the future by a scientist as eminent as Dr. James Bryant Conant, Harvard University president, is a rare and newsworthy event. He has gazed into his "crystal ball," he recently told the Diamond Jubilee meeting of the American Chemical Society-- "to be sure, a plastic one, as befits a chemical age." And here is what he sees ahead in the next 50 years: SOLAR ENERGY will become "the dominating factor in the production of industrial power" by the end of the century . . . DISTILLING FRESH WATER from the sea, by running modern compression stills on cheap and inexhaustible solar power, will turn nearby deserts into garden spots . . . COAL will be gasified underground, and cheap farm crops converted into gas, to manufacture fuels and chemicals . . . BEER, wine and spirits will be made entirely from synthetic alcohol, with flavor added by a minor fermentation . . . THE ATOMIC AGE will have brought about neither a "holocaust" nor "golden abundance." Among many factors limiting use of atomic power will be "gigantic problems" of disposing safely of radioactive wastes . . . WORLD WAR III will have been averted, although "by the narrowest of margins," by the free world's armed strength. New York and other great cities will still be standing, unscathed by bombs. And despite "grim years" just ahead, the next half century may yet prove "a period of gradual disarmament and peace."

DRAMATIC CURES of meningitis cases within six days are reported with the new wonder drug, terramycin.

TINLESS "TIN CANS" are ready for production to conserve the strategic imported metal. Two substitute materials developed by Reynolds Metals Company: Heavy aluminum foil coated with plastic; and "aluminized steel," made by rolling steel between aluminum-foil layers that become firmly bonded coatings.

THE LINCOLN CONTINENTAL design that car fans rate so high (see p. 161) may reappear, after some 10 years' absence, on '52 Lincolns, one Detroit rumor says.

COLORED DUCKLINGS--red, blue, pink or yellow--seen in eastern marshes needn't send unbelieving observers to the oculist. Coloring ducks' plumage, by injecting dye in their eggs, now supplements bird-banding to aid in studying the game birds' travels.

PAPER RUGS are one result of mixing synthetic neoprene rubber with paper pulp--an idea perfected by du Pont after spending three years and nearly $1,000,000 on research. Rugs woven of the rubberized paper are said to be long-wearing, washable.

YOUR OWN EYEGLASS lens can be fitted into a new eyepiece for one imported camera. It is available as accessory for the Exakta V, distributed by Exakta Camera Co., N.Y.C.

A HIGH-SPEED GEAR CUTTER devised by a Michigan tool firm may relieve a bottleneck in defense production. It accurately cuts gears and splines four times as fast as previous single-spindle machines do, the makers say.

HONEY-COLORED RASPBERRIES come from a new hybrid variety named the Amber, developed at New York State's Agricultural Station.

A HIGH-PRESSURE PUMP of new design will work at more than 100,000 pounds to the square inch, equivalent to explosive pressures reached in the barrels of big guns.

The Editors

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MECHANICS
and
HANDICRAFT
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Lumber stacked solidly can take years to dry. After several months in a lumberyard, these boards are still so green that moisture stands in pools on those underneath the top boards.

How to Use Green Lumber

You may save close to half the cost of a job by buying green lumber and seasoning it yourself.

By Paul Corey

HAS the price of dry lumber discouraged some of your home-repair or remodeling jobs? Go back to your lumber dealer and take a look at some of the green stuff he has stacked in his yard. Unseasoned lumber may solve your problem.

I wanted to put a wooden ceiling in part of my house. The job called for 500 board feet of matched redwood V-joint boards.

"I've got just what you want," the lumber dealer said. "But I hate to tell you the price." I hated it, too, when I heard it. He wanted $250 a thousand feet for clear, dry lumber.

Instead, I bought a thousand feet of No. 3 grade. It had some knots, a few splits, and it was so wet that it squirted water when you drove a nail into it.

But the price made up for that. It was an encouraging $70.

The choice boards from it gave me my ceiling, a cash saving of $55 and a bonus of 500 feet of lumber that I've used for basement repairs, outbuildings and other such jobs. I earned the saving and the

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bonus by stacking and "sticking" the lumber to air-dry it.

How to season it. To air-dry lumber properly, the boards must be stacked in layers with the layers separated from each other by stickers—strips of seasoned wood 1″ thick and 1½″ to 2″ wide.

Start by laying down two-by-fours on edge. Two-by-sixes are better if you have them. Set these base supports 16″ to 36″ apart. Place the first layer of boards to be seasoned on the base supports. Leave 1″ to 3″ of space between the edges of the boards. Then lay stickers on this first layer of boards. Space the stickers 48″ apart.

Put the next layer of boards on the stickers. Locate each sticker above the one below and continue to build the stack. Placing the stickers one above the other will lessen warping as the lumber dries.

How to avoid checking. The little splits that develop in the ends of boards are called checking. They occur when the ends of a board dry faster than the center. One step that you can take to reduce this waste of lumber is to paint the ends of the boards. A coat of paint will seal the ends and keep them from drying faster than the rest.

Where to air-dry lumber. The best spot is an open shed or a garage where the air can circulate freely but rain can't get in. An overhead rack like the one shown saves space. It is particularly good in a heated basement in the winter. Air near the ceiling is likely to be warmest and driest.

You can dry lumber outdoors, too, especially in the summer. After you have built the stack, cover it with a tarpaulin to keep out the rain and the direct rays of the sun.

If you don't plan to season lumber regularly, building paper makes an inexpensive substitute for a tarp.

Overhead rack provides efficient drying without stealing valuable floor space in your shop. To air-dry lumber (below) stack it with sticks between the boards to keep them from touching each other. Stack should also be covered with a tarp to keep off rain.

Building with green lumber. If you are in a hurry, there are a couple of ways of building with green lumber and letting it season after the job is finished.

With matched lumber, such as tongue-and-groove or shiplap, put up the wall in the usual fashion—but use small finishing nails. Then you will have a wall during the time the lumber is drying. After a few months you can easily take the boards down by driving the small nails right on through with a nail set or slender punch. Then put them up permanently, drawing them tightly together as you go.

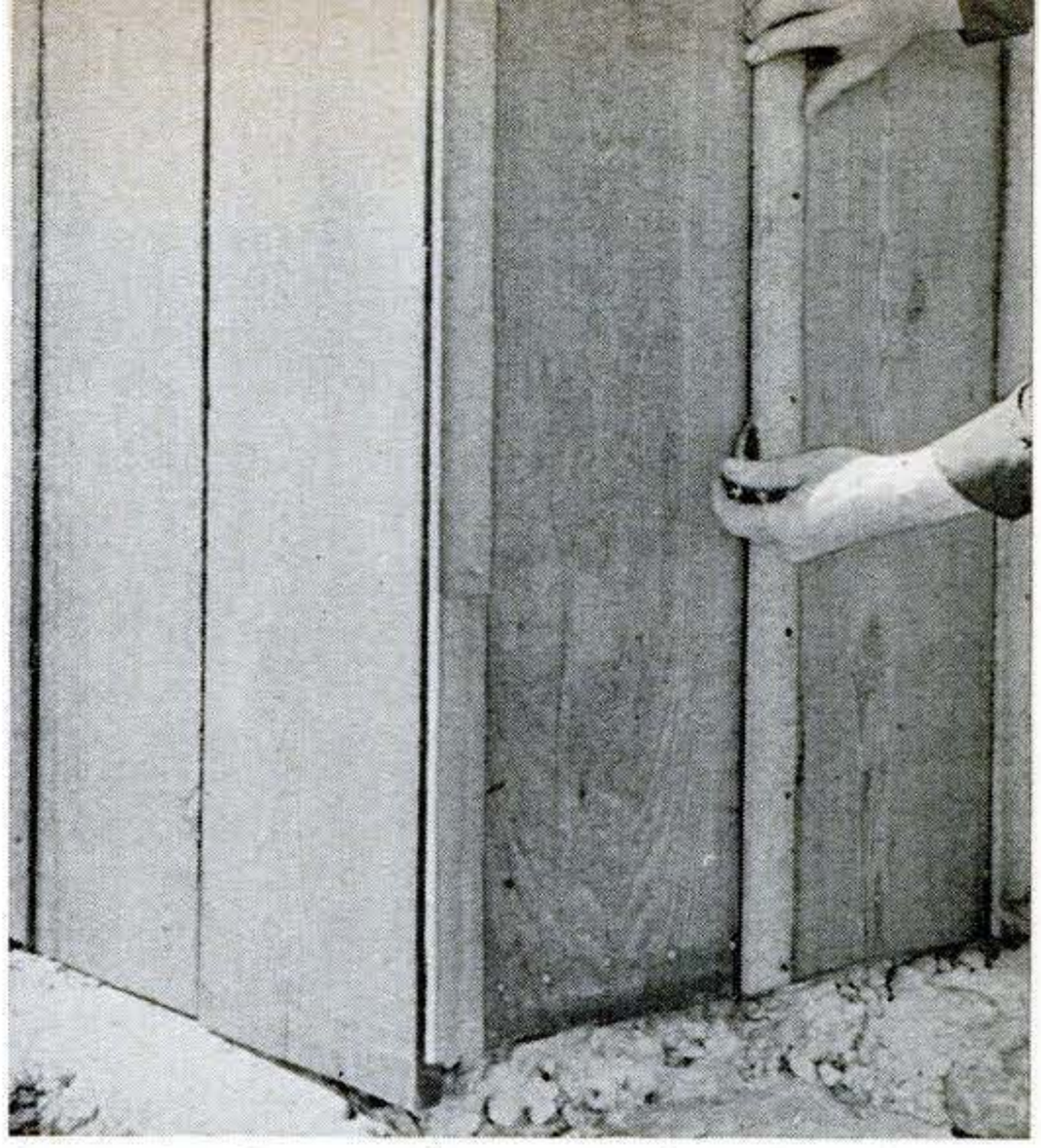
In return for your extra trouble, you get a wall at once and still end up with one fitting tightly together.

Another, and even simpler trick, works with board-and-batten construction. Just put it up in the standard way, but nail the battens along one edge only. After the boards have shrunk, complete the nailing.

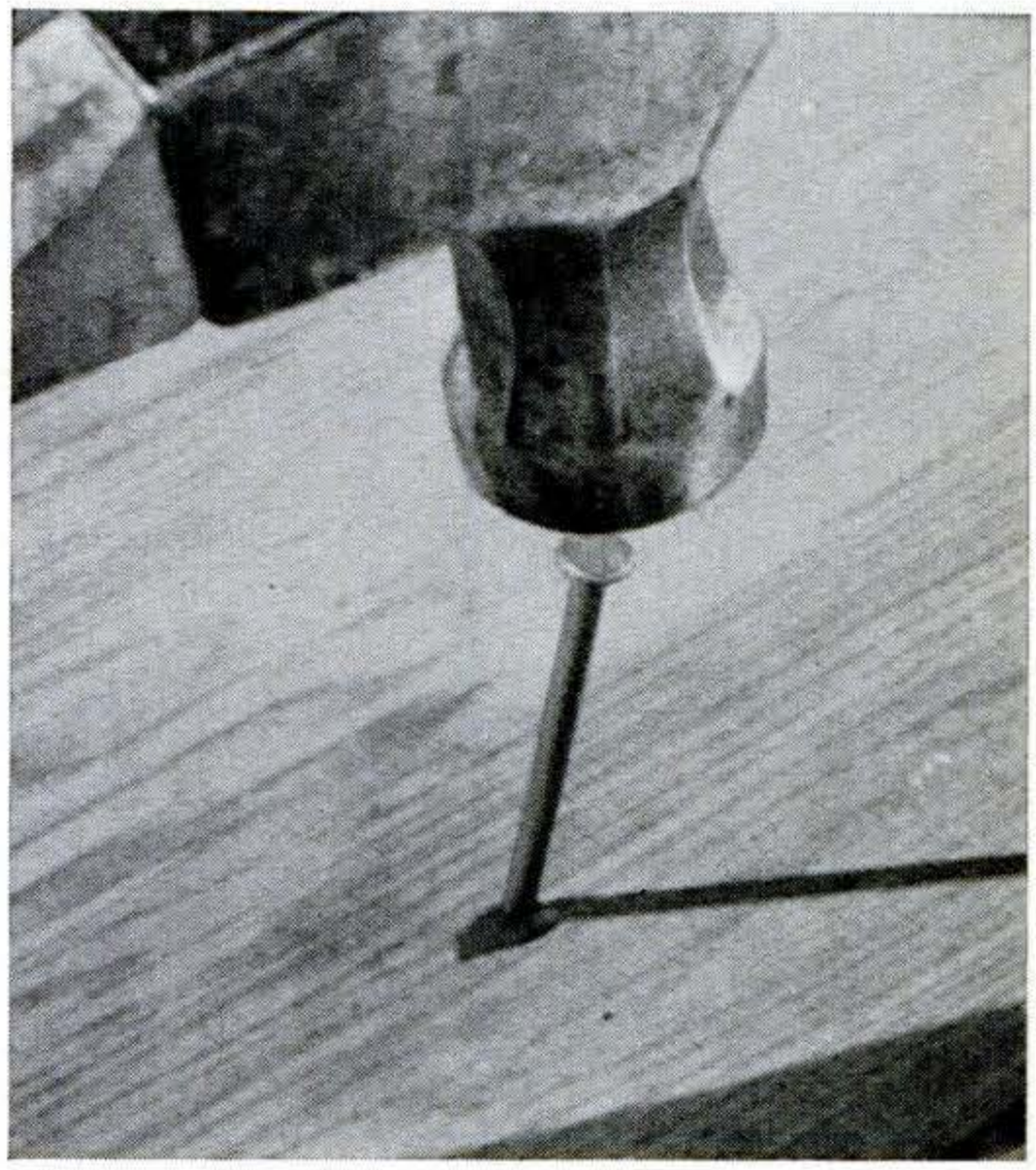
How dry should wood be? Moisture content of wood as it comes from a tree may amount to only 30 percent of the dry weight in the heartwood of some species, while the sapwood of some conifers may contain twice as much water as wood. Given enough time, wood loses or takes on moisture until its content is in balance with that of the air around it. So the ideal is lumber of the same approximate dryness as the air in which it is used. Wood used indoors usually should be drier than wood for exterior application.

How to predict shrinkage. Should you decide to build with green lumber and let it season in service, you can get a good idea of how much shrinkage to expect by a simple test. The only equipment you need is your kitchen range and a ruler.

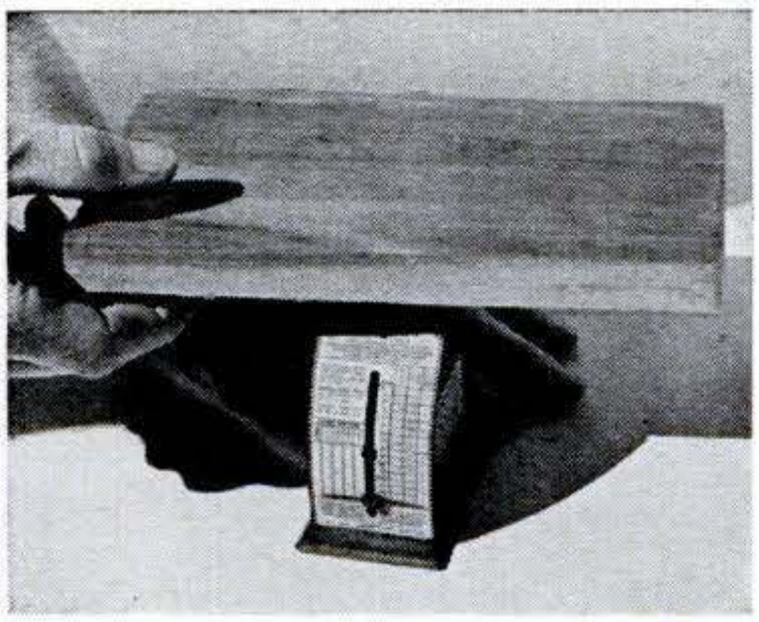
Cut a small sample of the lumber at least a foot from one end of a board. Bake it in an oven at 212° for at least four hours. Then measure it and compare it with the

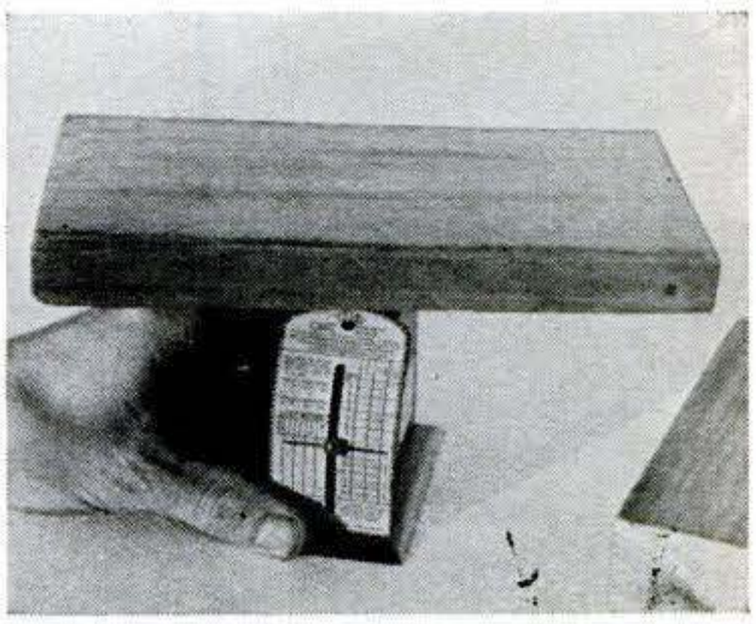


Green lumber can be seasoned on the job. Battens were nailed on one edge. After wallboards dried and shrank, other edges were nailed.



It is easy to spot green lumber. A nail driven into it will produce moisture. Board above is heart redwood, moisture content 88 percent.





Sample of wet lumber (left) weighed 16 oz. After heating it in oven, it weighed only 8½ oz.

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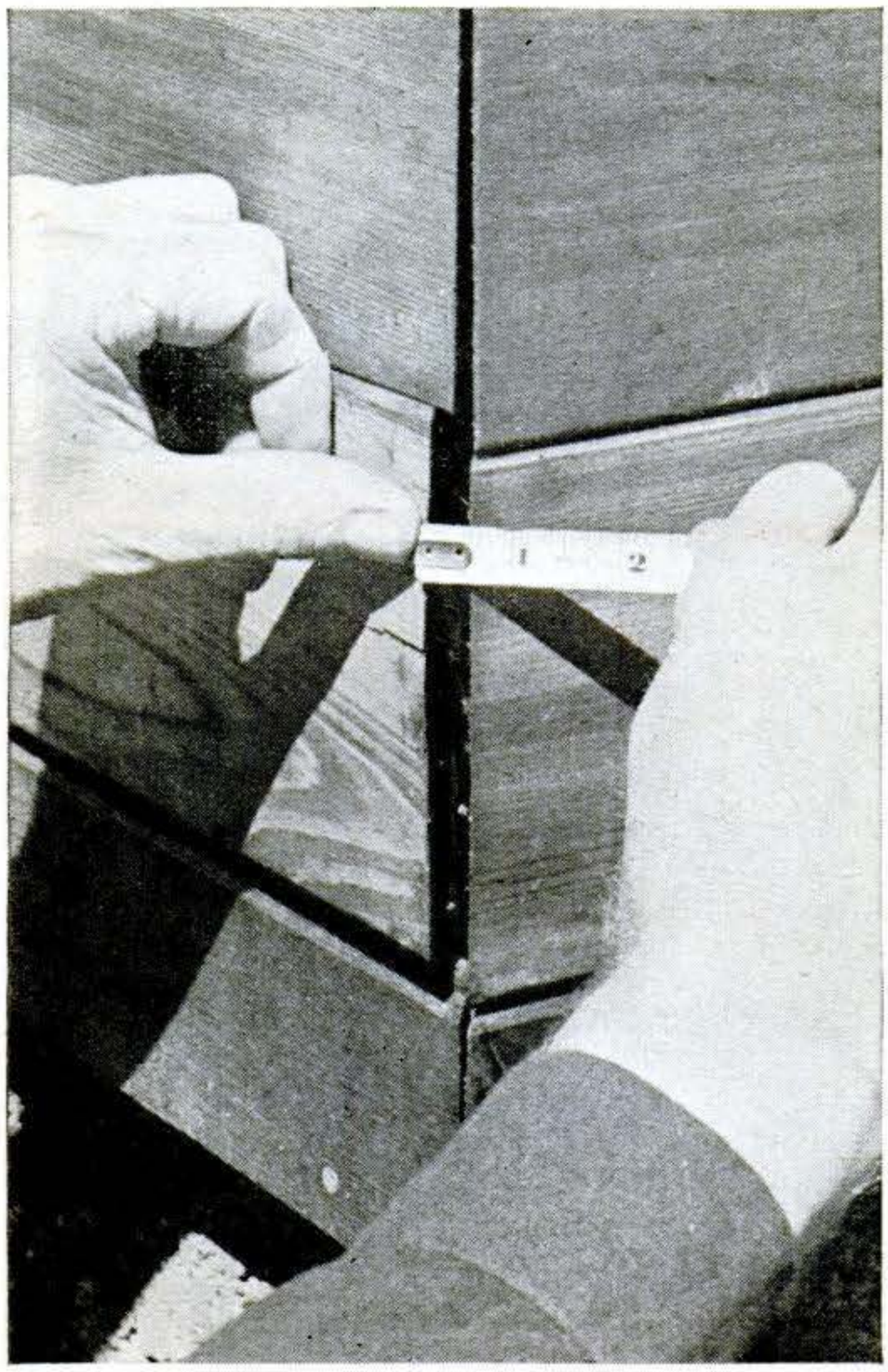


Gaps at joints, caused by shrinkage, are result of using green lumber. You can avoid this by air-drying your lumber before using it.

undried piece that the sample was cut from.

Wood shrinks least lengthwise—along the grain. Across the grain it shrinks much more, with the greatest loss in the plane of the growth rings.

How to measure moisture. You can also run a test to check when your seasoning lumber is at its most desirable moisture content for your part of the country (see map below).

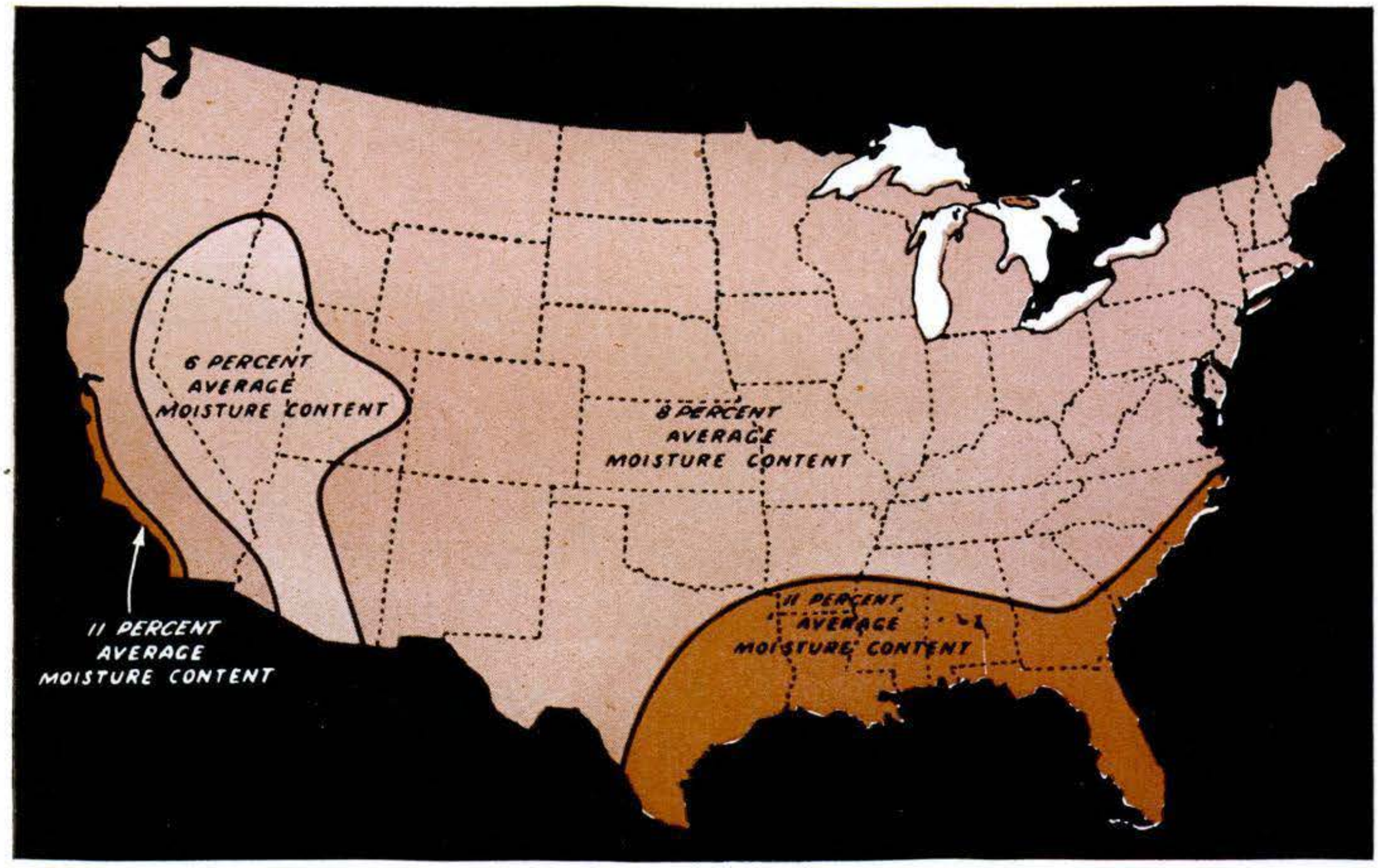
Cut another sample a foot or more from the end of a board. Use a sample that you can accurately weigh with whatever scale you have. Bake the piece in an oven at 212°. After a few hours, weigh it, and make a note of the weight. Bake it again. Weigh it again. Repeat the baking and weighing until two weighings give you the same figure.

Then subtract the dry weight from the original wet weight. Divide that figure by the dry weight.

Here's how the figures work:

The piece of 1″ redwood, shown on the scale in one of the photos, weighed 16 oz. wet. After a day and a night in the oven it weighed 8½ oz. Sixteen minus 8½ is 7½. And 7½ divided by 8½ and multiplied by 100 gives moisture content as 88 percent. END

Next Month: How to make a planing block to cut wood with machinist's precision.



Moisture-content averages recommended for interior-finish in various areas of U.S. are shown above. Sheathing, exterior trim, siding, framing can be about three points higher.

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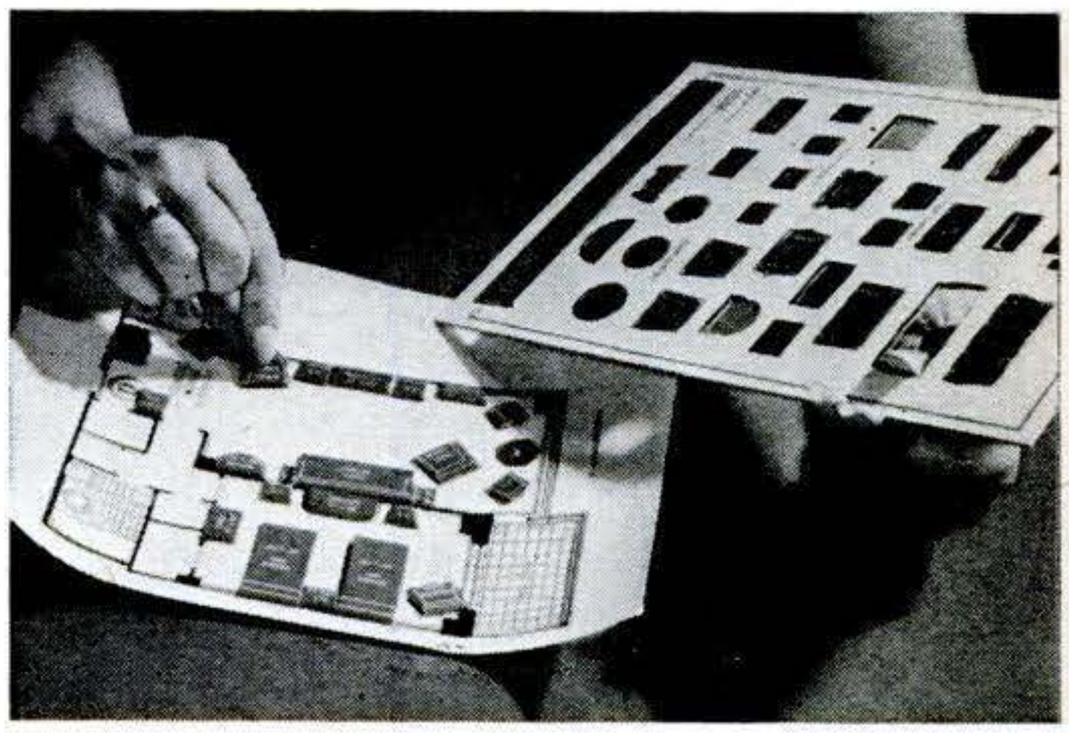
Big Trees Fail to Stump Rancher

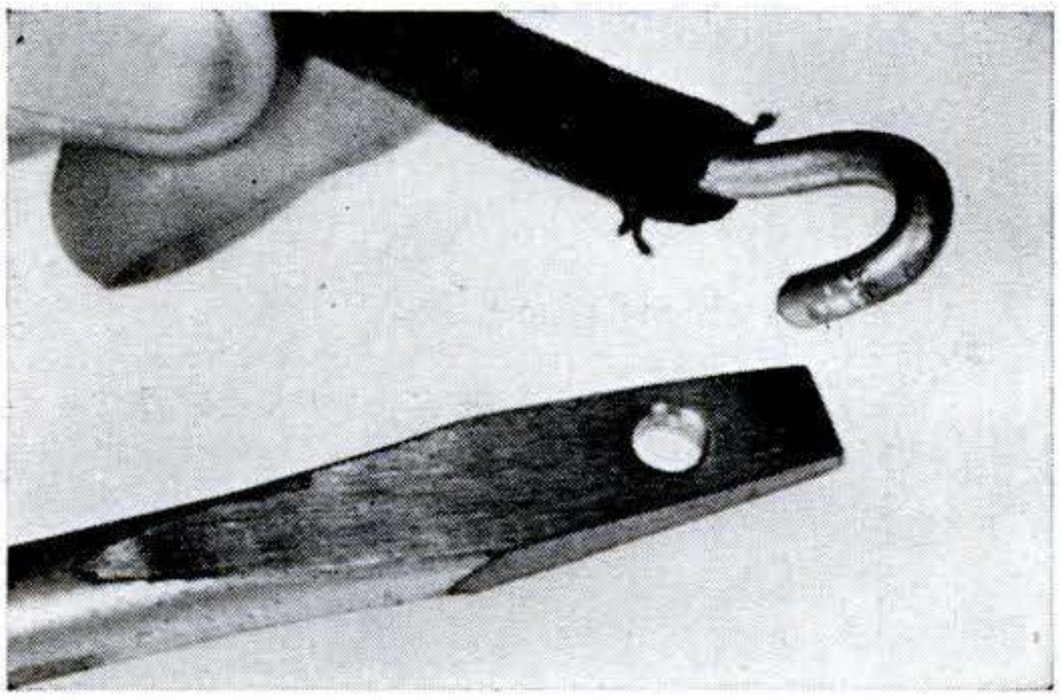
BILL SHEPARD, manager of the Star Brand ranch near Dallas, had 6,300 acres of bottom land to clear for grazing. The bulldozer would handle brush and small trees, but he needed something more for big timber.

So the ranch shop built a bumper of 4″ pipe. Attached to the 'dozer by quick-pull pins, it hits the trees 12′ above the ground, toppling big trees with a single push. *—Elmer Weaver, Chicago.*

Arrange Furniture on Plan

IT'S hard to tell how furniture will fit in a new setting, so one real-estate company gives prospective tenants the apartment floor plan and a set of furniture cut outs drawn to scale. With the pieces arranged on the plan, the prospective tenant can tell at a glance how the baby grand fits in and whether he will need that oversize credenza. Called Min-U-Teriors, the cut outs may soon be made available by Bing & Bing, New York City, to other firms.





Screwdriver Curls Wire

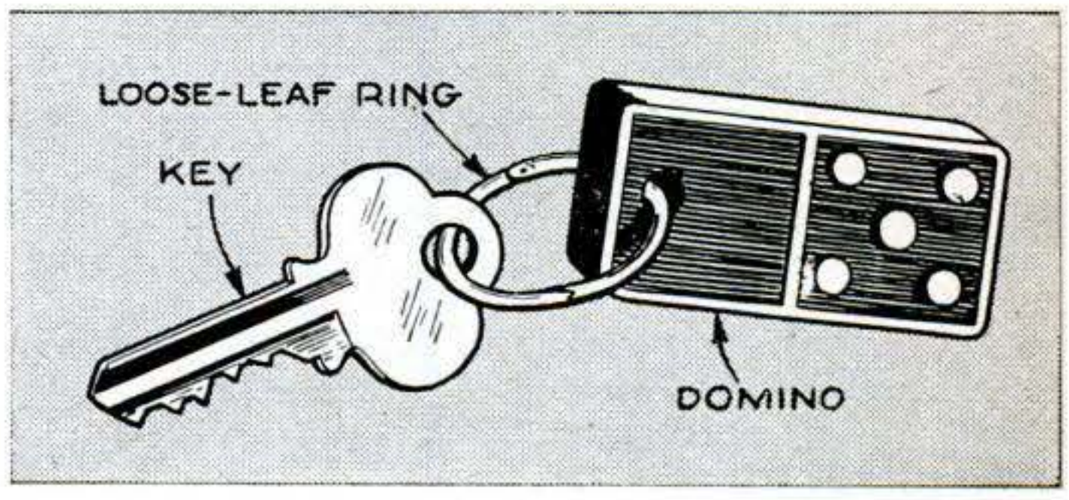
CURLING the end of a piece of wire to make the hook that holds it securely around a screw terminal is easy with this screwdriver. Designed especially for electricians, it has a hole in the blade to form the wire hook quickly. It is made by the ALBX Manufacturing Company, Rockford, Ill.

Rubber Tubing Starts Screw

A LENGTH of windshield-wiper hose is handy for starting screws in hard-to-reach places. Press the head of the screw into the tubing, turn to start the threads in the hole, then pull off the hose and use a screwdriver.*—L. Shepard, Toledo.*

Keys Identified by Dominoes

DOMINOES you're not using any more make good key holders—the number of dots helps you identify each key. Drill a hole in the domino and insert a hinged ring of the type used in loose-leaf binders.*—Frank Shore, Manhattan, N. Y.*



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Saving Heat and Money

Does the heat you pay for leak out of the house?

FEW houses are as tight as they could be. If yours leaks heat, you'll have to pay for heating part of the outdoors. Here's how to keep heat in:

☐ **Storm windows.** Make sure they fit tightly, and get them up early. Storm sash on basement windows help too. Heat kept in basement makes whole house warmer, but don't make basement too tight. Burning any fuel requires air.

☐ **Storm doors.** Like a single window, a single door transmits heat to outside. Even better than ordinary storm door is an outer vestibule.

☐ **Automatic door closers.** You can't expect to save money if doors stand open. Automatic closers will pay if children run in and out.

☐ **Insulation.** In the attic it acts just like a blanket. Insulating the walls is more difficult, but it pays. Insulation is needed too in walls that adjoin unheated parts of a home, such as an attached garage. A floor over a crawl space will stay warmer if insulated.

☐ **Weather stripping.** Cracks around doors and windows let heat escape and cause drafts. Masking tape over cracks may help even if windows are weather-stripped. Changing the position of window locks will often make the windows close more snugly and keep out drafts.

☐ **Calking.** Use the compound to close up openings around window and door frames.

☐ **A finished attic.** Close up cracks under the eaves, finish off the space with insulating board, and you'll note the difference. A tight roof keeps heat in, rain out.

Does your family have good heat-saving habits?

WHAT you and members of your family do or don't do may send your heating costs soaring. Carelessness can rob the bank account. Keep these points in mind:

☐ **Reduce the temperature.** Health authorities say 70° is warm enough. Cut it 5° or 10° below that while you sleep or if you'll be away from home all day. Set the thermostat at 55° if you're going away several days.

☐ **If you sleep with open windows,** turn off all heat in the room and close the door.

☐ **Fill the humidifiers.** Proper humidity will reduce the temperature you need for comfort.

☐ **Close fireplace damper** when there's no fire. A chimney sucks out heat as well as smoke.

☐ **Pull the shades and close curtains** when sun goes down. This forms air space to keep in heat.

☐ **Close up unused rooms.** If possible, turn off the heat at the basement. Be sure doors to such rooms close tightly. Seal the space underneath with a rug or weather stripping.

☐ **Ventilate properly.** Close a room and turn off the heat to it for several hours before opening the windows to ventilate the room.

☐ **Watch the vents in storm sash.** If yours have vents, remember that leaving them open sharply cuts their insulating value.

☐ **Don't overheat a garage.** Most cars will start all right if the garage is only 40°. Be sure to close the doors of a heated garage.

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Don't invite Old Man Winter to your housewarming this year. Check these points and save fuel.

Was your thermostat put in the right spot?

A THERMOSTAT is sensitive only to temperature in its immediate vicinity. For that reason its location is very important. Is yours . . .

☐ **Too high or too low** on the wall? You sacrifice efficiency if it is. Five feet above the floor is just about right for a comfortable temperature.

☐ **In a draft?** Even if it's located in the current that normally comes down a stairway, it will call for more heat than a home needs. Also be sure that cold air from a frequently opened door doesn't strike it.

☐ **On an outside wall?** If so, it will call for too much heat. An inside-wall location is always best. But be sure the adjoining room is heated. Even a cold inside wall would affect it.

☐ **Too near a source of heat?** A radiator, register, range, fireplace or even a lamp may cause the thermostat to turn off too soon. Because house is cool, you'll keep turning up the heat, usually so much that heat will be wasted.

☐ **In the wrong room?** For example, if you do most of your inactive sitting in a den, the living room is no place for the thermostat. The den is the room you want comfortable.

☐ **In good working order?** A thermostat that lets temperature fall several degrees before calling for heat adds to fuel costs and detracts from comfort. A new one may be best. If temperature setting on thermostat face doesn't correspond with thermometer, have it calibrated. Clean dust off electrical contacts, but do not use sandpaper on them.

Is your heating system working efficiently?

THERE are chances of waste or loss all the way from the bin or tank to the tip of the chimney or the remotest radiator or register. Here's what to look for:

☐ **Chimney** should be at least three feet higher than roof peak for best draft. Buildings or trees nearby may cause downdrafts. A chimney that leaks smoke or that has much of its surface exposed to the weather may have poor draft. An automatic regulator will cut heat losses from excessive draft.

☐ **Soot** in the combustion chamber and flue acts as an insulator, robbing you of heat. So does an accumulation of fly ash. Soot in the chimney limits draft. Clean it out.

☐ **Insulation** around hot-air ducts and water and steam pipes will send the heat where you want it. So will insulation on the furnace. Insulation is especially important on ducts or pipes that pass through outside walls.

☐ **Rust and scale** accumulate in boilers and furnaces, cutting down heat output. The same thing happens in hot-water tanks. Use some boiler-cleaning compound.

☐ **A hot-water coil** in a furnace uses heat. If too close to the fire, it may reduce efficiency.

☐ **Thermostatic controls** will do a better job than you can—even though you think you're a check-and-damper expert. Too low a setting of a hot-water or steam limit control can keep a boiler from reaching efficient temperature.

☐ **Too little heat in one room** forces you to overheat the rest of the house. A circulating

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blower will help if it is a hot-air system. For a hot-water system, use a circulating pump.

☐ **Leaks and cracks** cost money. Warped fire and ashpit doors let in more air than a fire needs. A crack around a clean-out door cuts down efficiency. Seal it with furnace cement. Cement any leaks in fire pot or furnace sections. Repack leaking radiator valves.

☐ **Too few registers or radiators** overwork the heating system. A bright metal shield behind a radiator makes it radiate more heat out into the room. Dust in or on registers and radiators also cuts heat output.

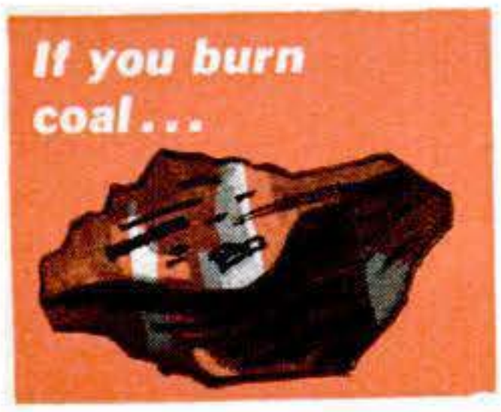
☐ **Warm-air ducts** should be equally spaced around all sides of the bonnet. In a gravity hot-air system, the ducts must slope up so heat can rise. Sharp turns slow circulation.

☐ **Cold-air return ducts** are often too few in number. The area of all return ducts should be 20 percent greater than all hot-air ducts. The cold-air return should enter furnace at floor level in a gravity system. Drawing in outside air and heating it costs money. See if additional inside returns can be substituted.

☐ **A warm-air blower** should be set to run for some time after a burner stops. Otherwise, all the heat produced is not used. If you have air filters, clean or replace them often.

☐ **Steam-radiator valves** should permit rapid discharge of air from the system. If they don't, you lose. Air trapped in hot-water radiators should be vented regularly.

☐ **Enclosures over radiators** may interfere with heat output. Unless they are designed for heating efficiency, better remove them.

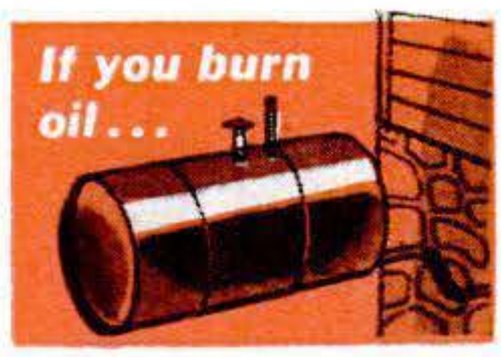


☐ **Warped or broken grates** will waste fuel and make it difficult to keep a fire. Buy new ones. Keep a protective layer of ashes over grates. This will lengthen their life.

☐ **Firing methods are important.** Avoid black smoke from the chimney. It means you are wasting coal. A hot fire for quick heating costs money too. Heat your home with a steady slow-burning fire. Don't bank too severely at night. Deep bed of coals makes a thriftier fire. In mild weather, leave deep bed of ashes at all except center of grates. Carry a deep fire there. Shallow fire is harder to control.

☐ **Shake down ashes** only until first red glow shows in pit. Sifting ashes and throwing larger pieces on fire cuts burning efficiency. Clean out clinkers to avoid damage to stoker.

☐ **Know your stoker.** Adjust feed so home is kept warm with moderate running intervals. Adjust air for a glowing red fire, not a white one. Coal that's too coarse will burn too fast. Coal, ashes or clinkers clogging the air openings will interfere with combustion. If you use coke, break it up with a poker.



☐ **Nozzle size determines fire size.** A flame that is too big or too small costs money. Air should be set so you have neither a smoky nor a blow-torch flame. A worn or dirty nozzle will waste fuel. If oil drips from nozzle while the burner isn't running, check shut-off valve.

☐ **An ignition system** that doesn't ignite fuel quickly wastes oil. Clean soot or dirt from the electrodes, and set the gap according to the manufacturer's recommendations.

☐ **A CO_2 check** should be made twice a year to determine completeness of combustion. Your heating man can also check stack temperature.

☐ **Clean the filters.** If there's none in your oil line, better install one. Dirt in the oil means trouble. Also clean strainer built into burner fuel pump. Better clean oil line too. If yours is a vaporizing burner, use oil-line cleaner weekly.

☐ **Dirt or carbon** on the bimetal element of the stack switch can disrupt its operation. Inside burner housing or on fan blades, dirt or carbon can cut air so fire burns poorly.

☐ **Vaporizing burners** collect carbon easily. It is important to keep all parts of burner clean. If fire is weak or smoky, the constant-level valve probably needs resetting.

☐ **A thrifty flame** requires that regulator at burner be set correctly to control pressure or rate of gas entering burner, that piping and cocks between meter and burner be large enough for sufficient flow, that the orifice be free of dirt or grease, and that there be just the proper amount of air. Dirt in venturi tube or over the air shutter can reduce flame.

☐ **Baffles properly placed** in the combustion chamber will improve efficiency. Installed incorrectly, they interfere with good burning.

☐ **Burner position** in the fire pot controls heat distribution. Have an expert check this.

☐ **A pilot that is too large** can use a lot of gas needlessly. But don't turn it *too* low.

☐ **Little chimney draft is needed** for a gas flame. A strong draft will draw warm air out of basement. Consider a means of reducing it.

☐ **Frequent operation for short periods** may indicate waste. Have burner adjusted to operate longer with longer intervals between.

If a cold snap freezes pipes, there are tricks to the thawing-out job. See PS next month.

(Adapted from 179 Ways to Cut Heating Costs, *distributed by the Heil Co., Milwaukee, Wis.)*

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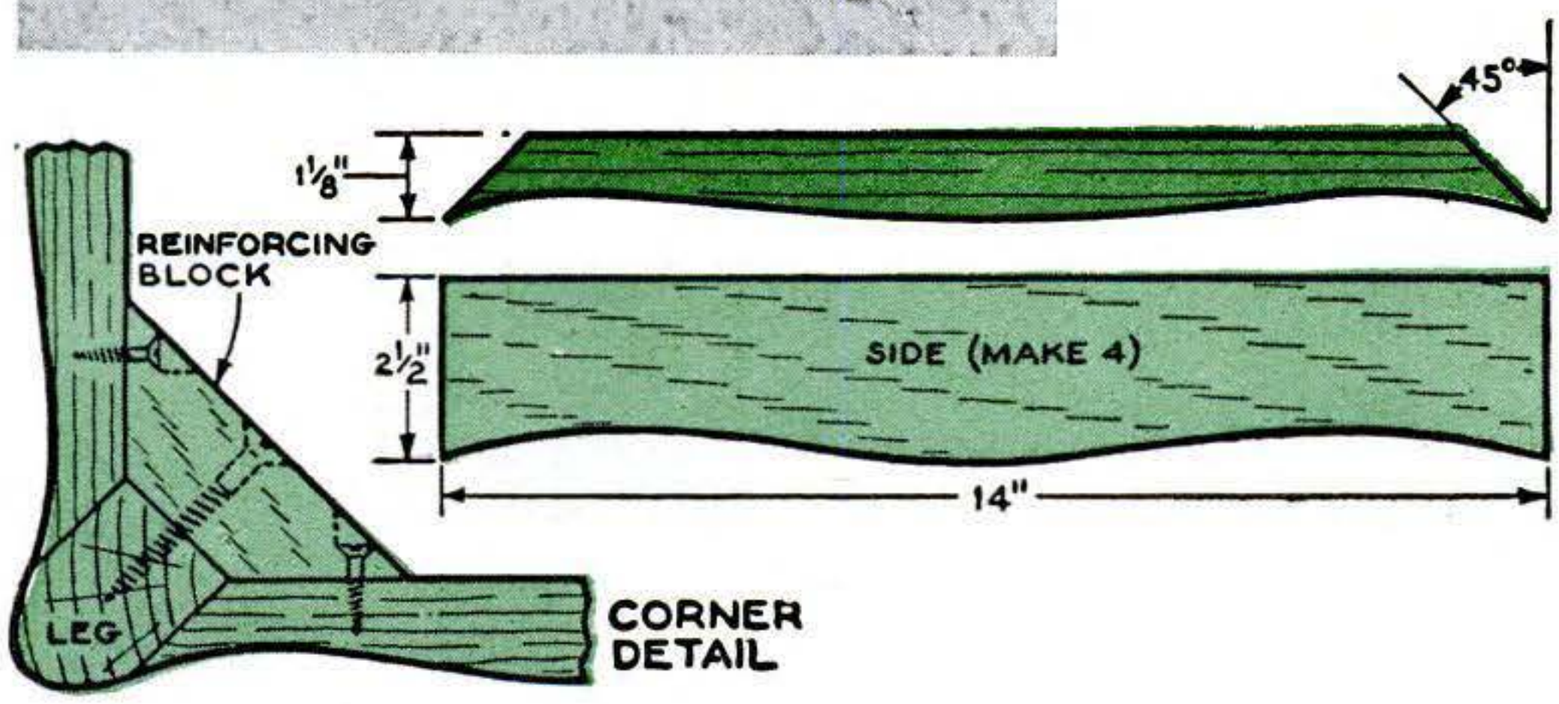
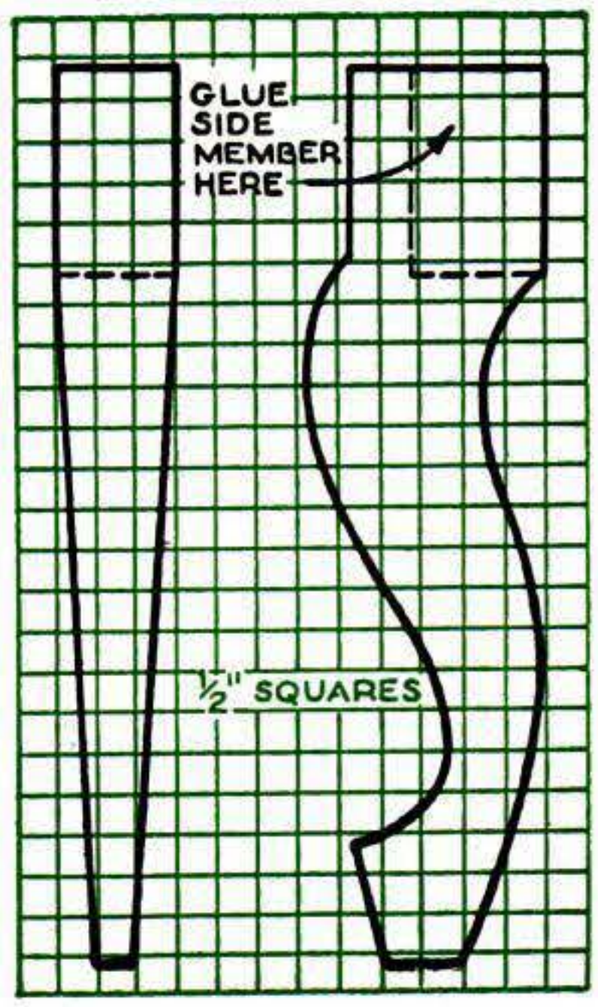
Carved Stool Needs No Carving Skill

Its flowing curves and etched lines are easier to make than you may think.



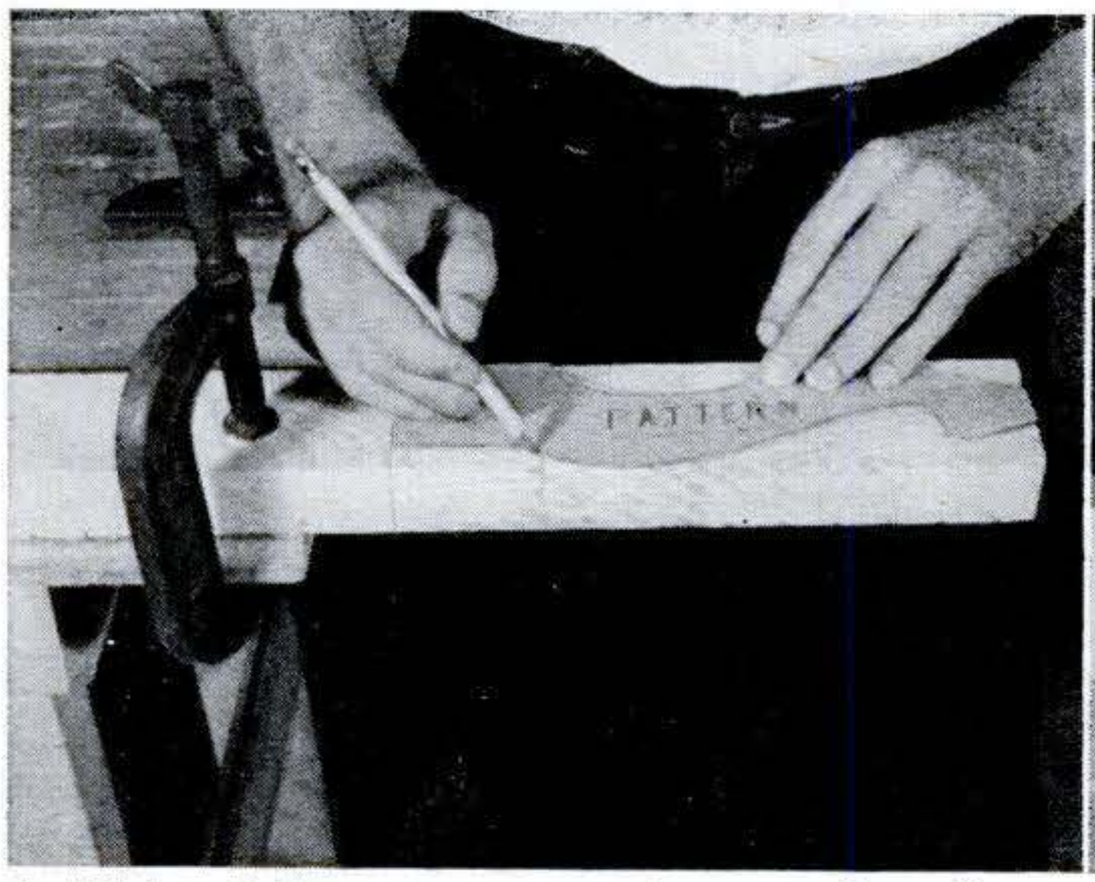


TURNING out a stool like this opens your eyes to the ease with which wood can be shaped into handsome furniture. Graceful curves and decorative carving make the stool look like the work of a skilled craftsman. Actually, I built it, and I'm a novice at woodworking.

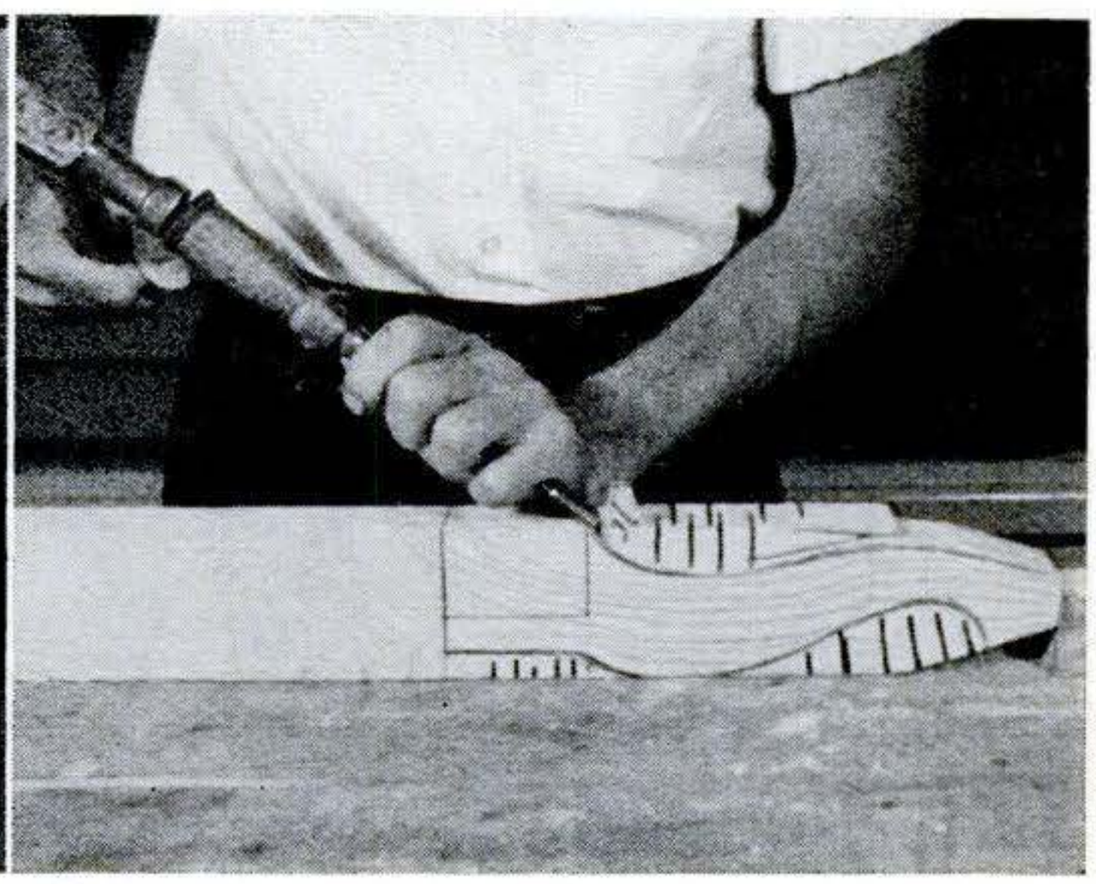
You need only a few tools—saw, hammer, chisel, rasps and clamps. The carving can be done with that most common of all tools—a pocket knife.

I made the stool from white pine because this wood is so easy to work. The drawings and photos show how to duplicate it.

To produce the fruitwood finish usually found on the French Provincial style of furniture, I first applied a coat of very thin yellow stain. This was made by dissolving



1 Make full-size patterns from cardboard as first step and trace on wood stock. Place base of leg flush with squared end of stock.



2 Rough out leg with hammer and chisel after making saw cuts. Complete the leg before sawing it free. *(Continued on next page.)*

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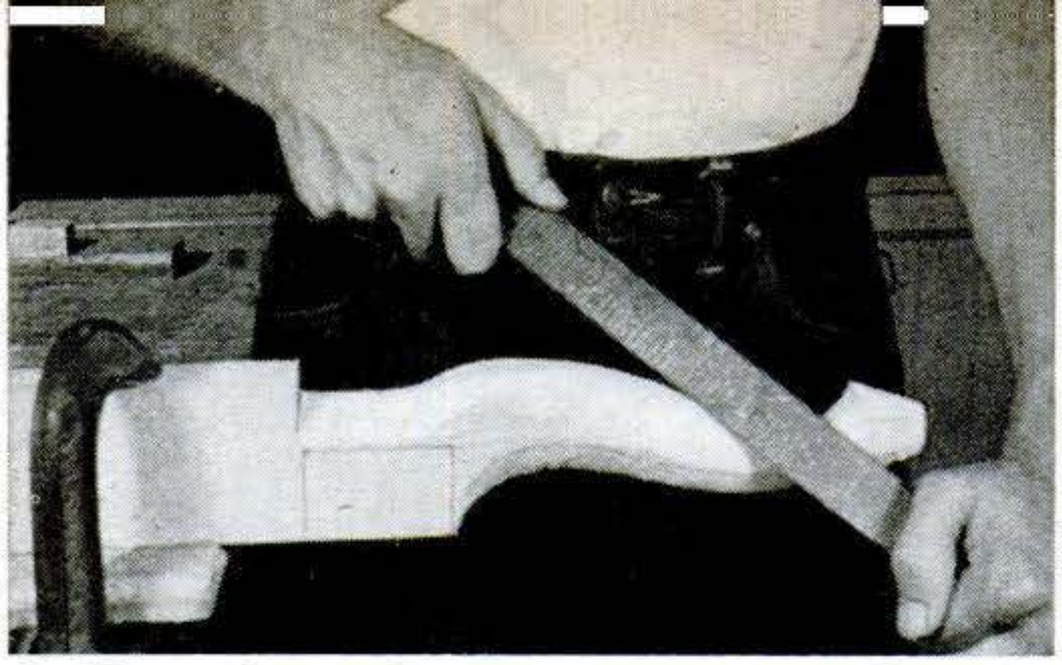
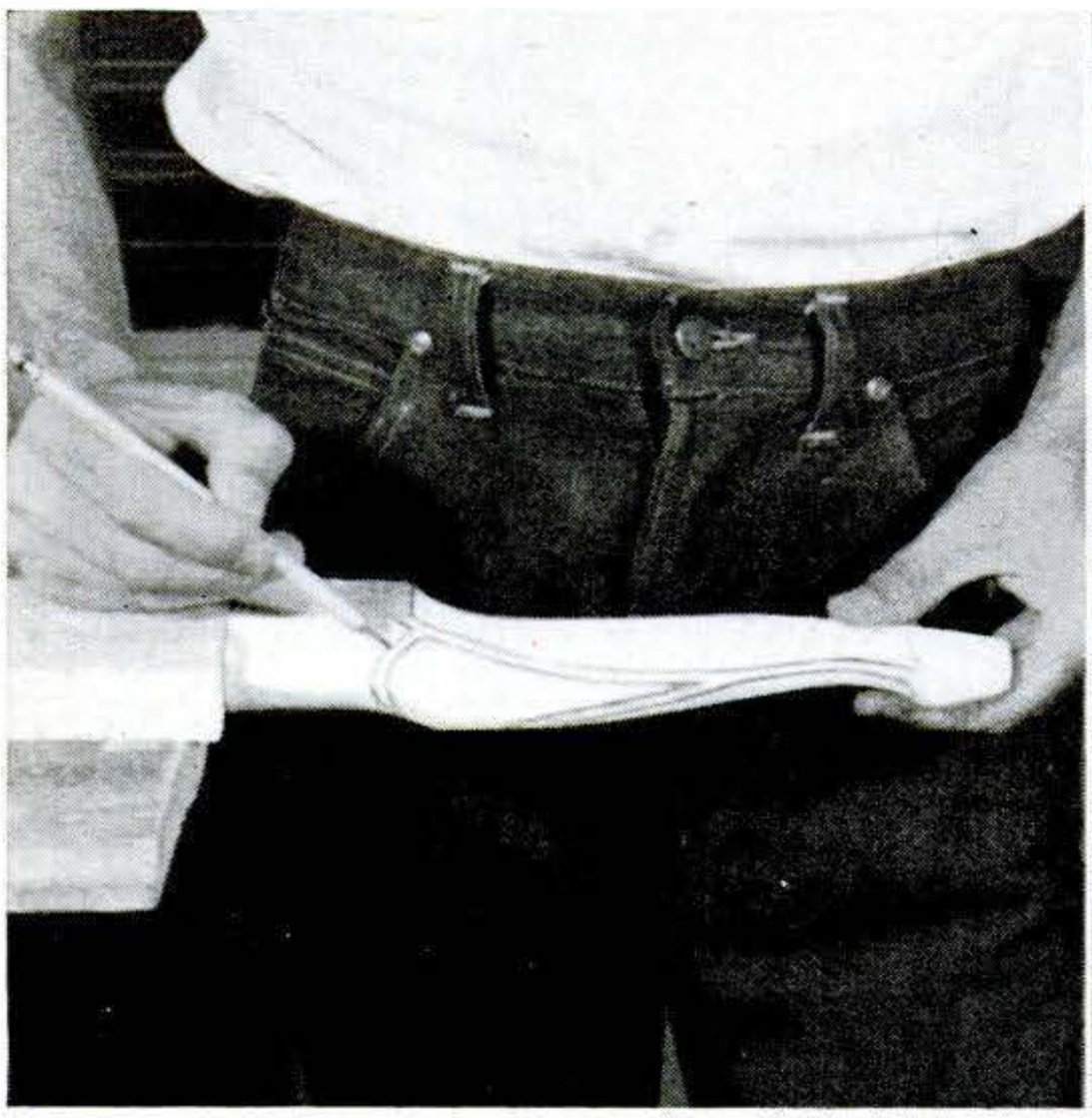
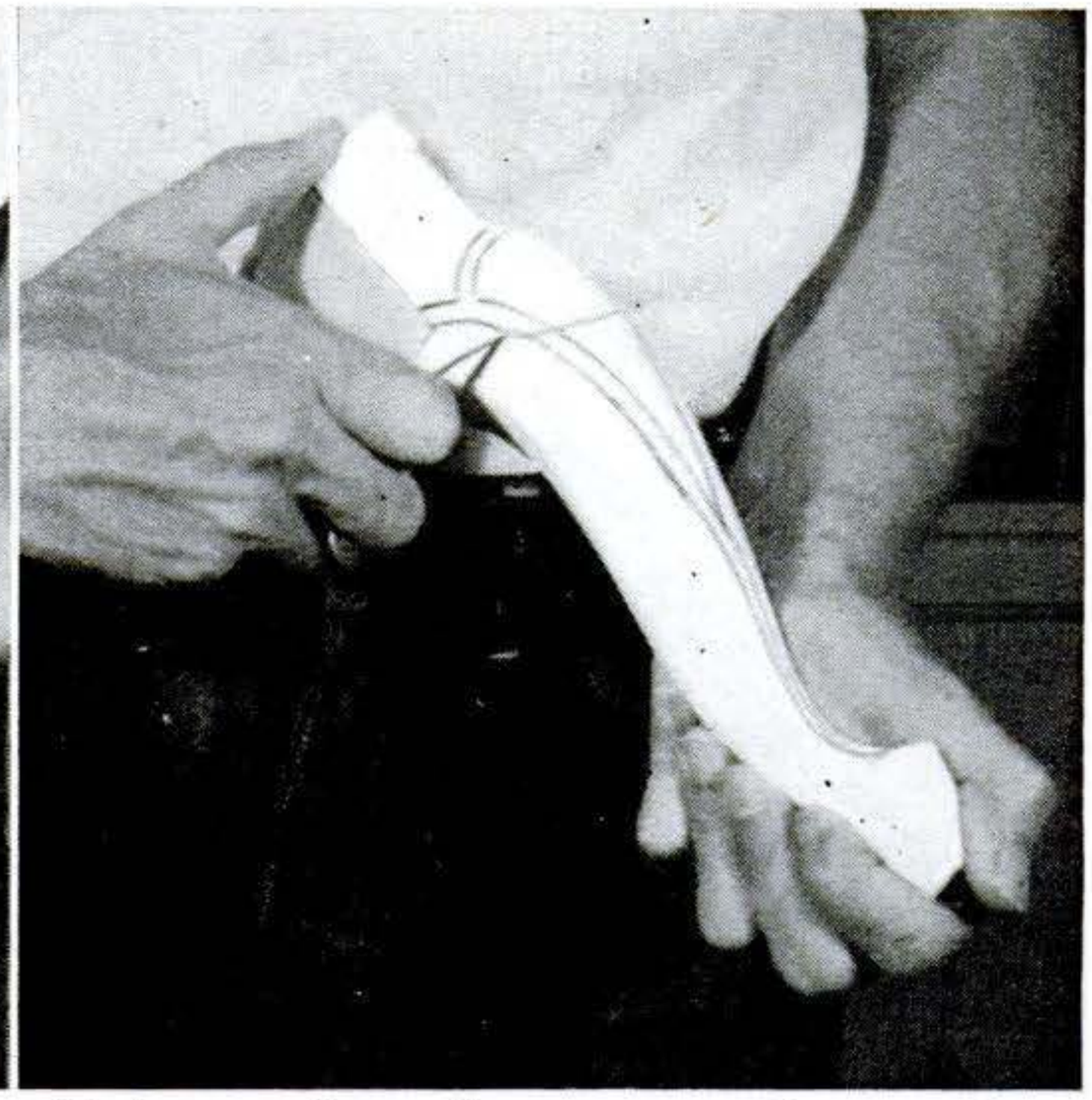


3 Shape leg with a wood rasp, rounding the corners and tapering the sides. Smooth it with a fine rasp and No. 1 and No. 1/0 paper.

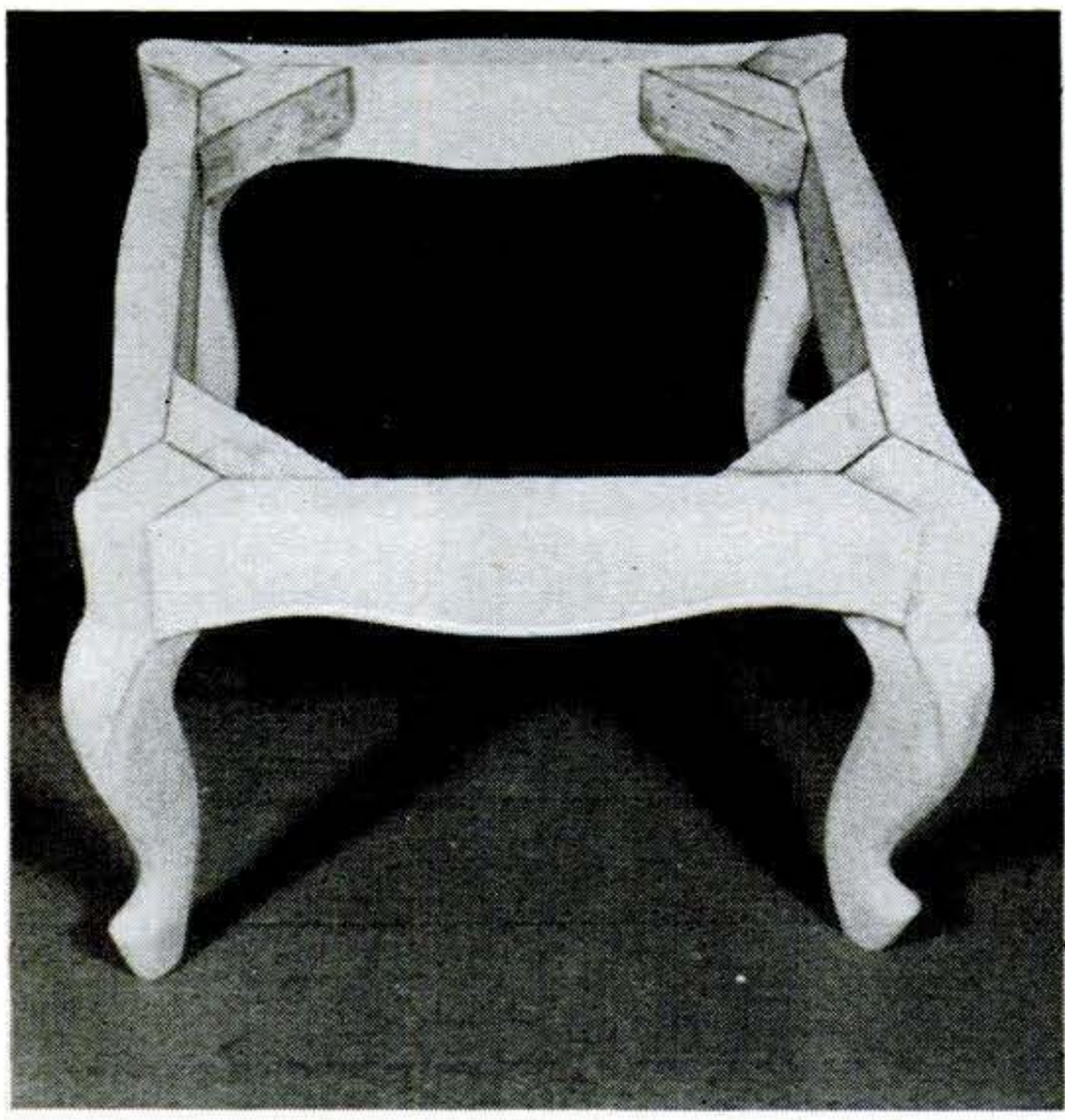
a small quantity of chrome yellow (artists' oil color) in turpentine. A brown oil paint (a mixture of burnt umber and burnt sienna) was then brushed on—and wiped off with a cloth. This makes the carved design stand out. Three coats of clear brushing lacquer, with fine sanding between each coat, completed the finish.

The cushion, made of unbleached muslin, was stuffed with kapok and covered with needlepoint.—*John Rogers, Dallas.*





4 Draw carving outline with pencil, and saw leg free from stock. Carving can be done with the small sharp-pointed blade of pocket knife. Make first cut along outline, holding blade at right angles to cut. Make second cut about ⅛" from first with knife at angle so sliver of wood is loosened. Sand the carved areas and the carving job is completed.



5 Assemble with glue and wood screws after all parts have been completed. Let glue harden a day or so. Then sand joints smooth.

6 Tack webbing tightly across top as support for the cushion. Upholster the stool after applying finish to the legs and sides. END

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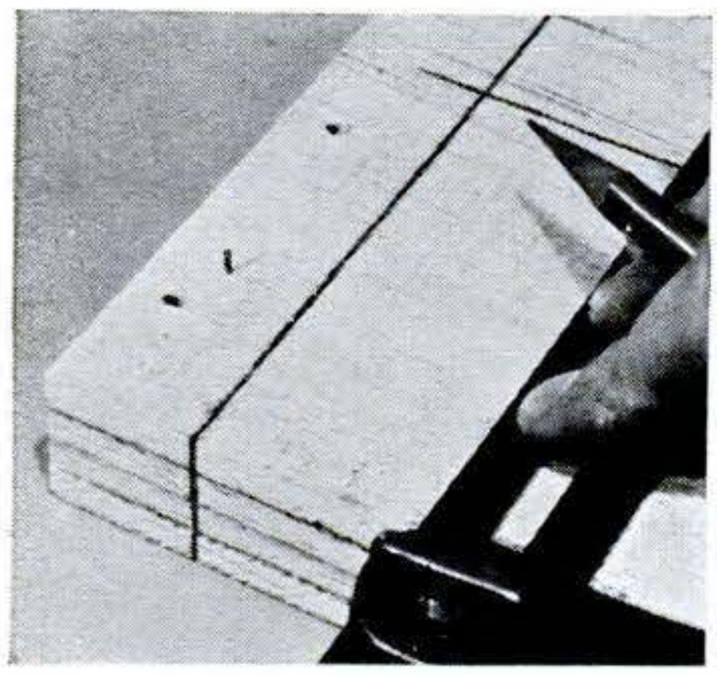
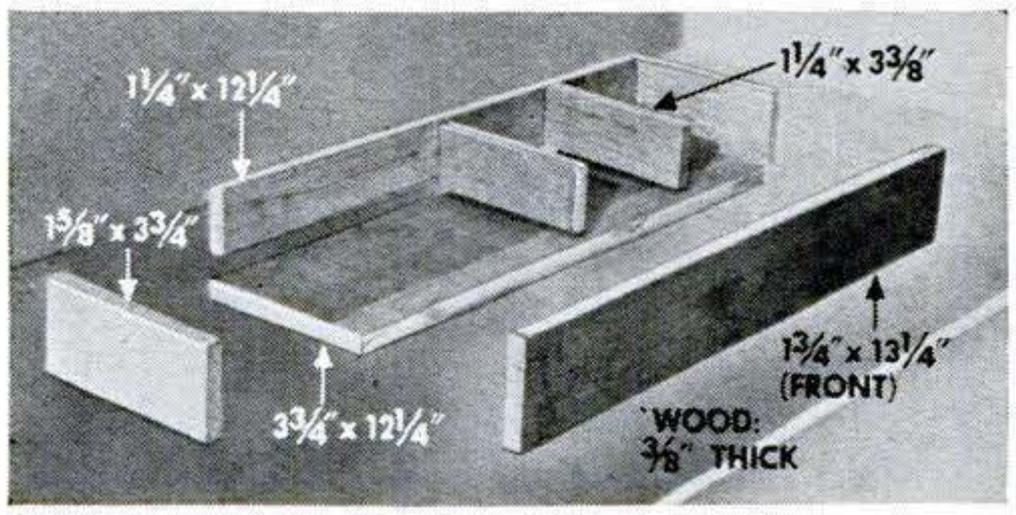
From Packing Box to Sewing Cabinet

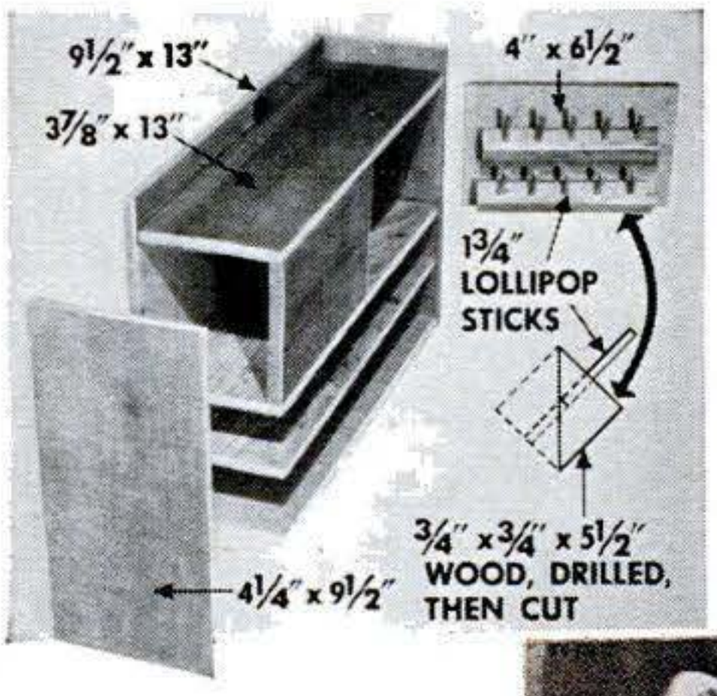


1 Wood salvaged from these apple boxes was tacked together by driving long brads through waste areas. Identical pieces for cabinet and drawers were squared off (left) and cut at same time. In knocking boxes apart, use a block of scrap wood under the hammer so the wood will not be marred.

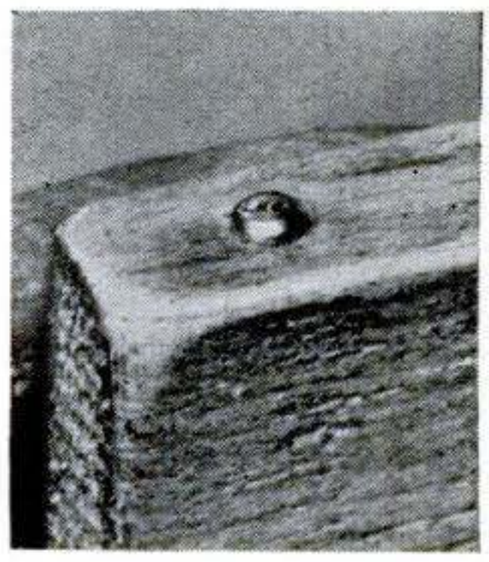
2 Drawer parts were cut and assembled first. Rest of cabinet then was built around drawers. Upper drawer (right) has two spacers, providing compartments for buttons, needles and other small items. Spacers were omitted from bottom one to take scissors and large items. Parts were sanded smooth before assembly.

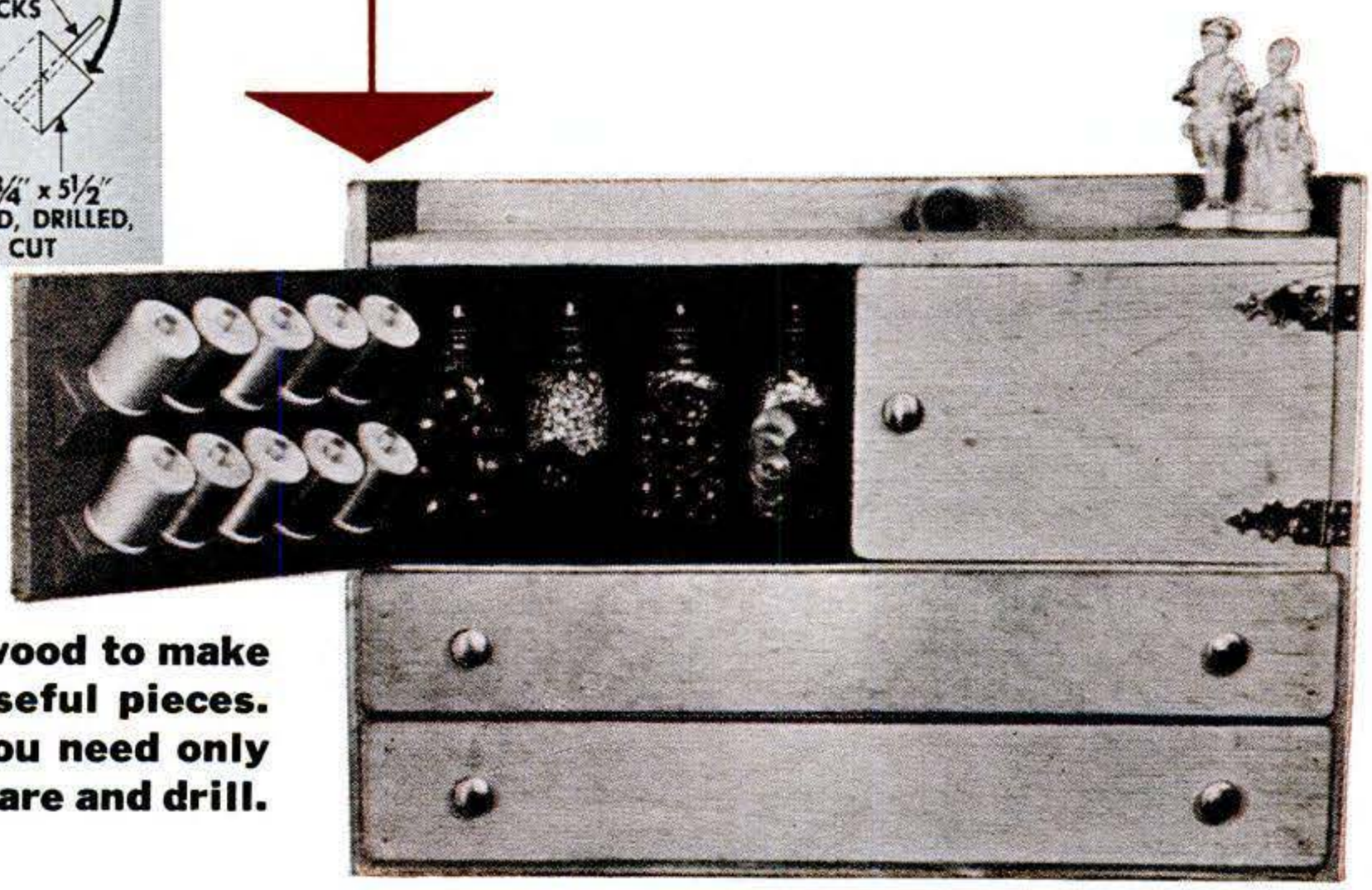


3 Main cabinet uses easy-to-cut parts. Spools go on lollipop sticks pressed into holes drilled in triangular-section blocks on doors. Put drawers in place and shim them with cardboard strips to provide proper clearance while lining up the drawer separators.



4 Escutcheon pin driven into upper corner of each door serves as latch. It catches in dimple drilled in under side of top piece. Other required hardware includes six drawer pulls, four small hinges, and pins to mount them. Paint the inside of drawers and top compartment, give outside a natural finish. Nails through back hold cabinet on wall. Buttons are kept in pill bottles.





Old crates supply wood to make many handsome, useful pieces. For this cabinet, you need only a hammer, saw, square and drill.

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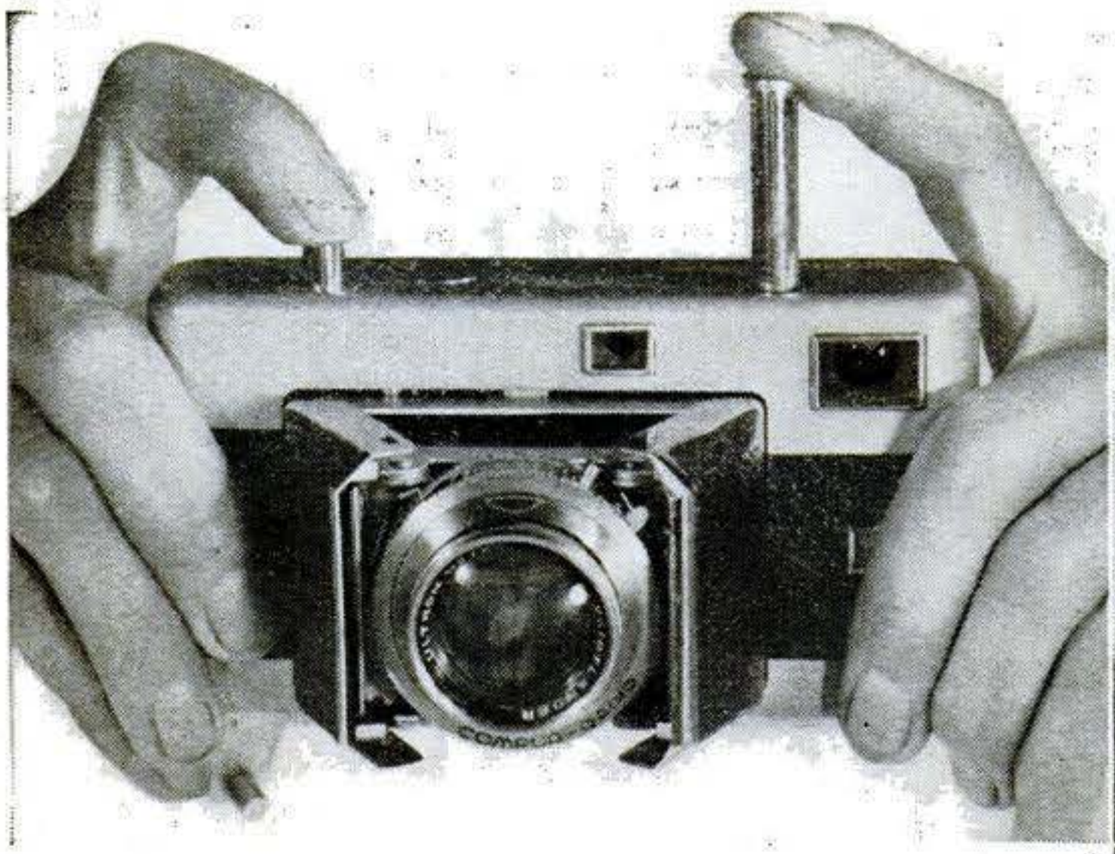
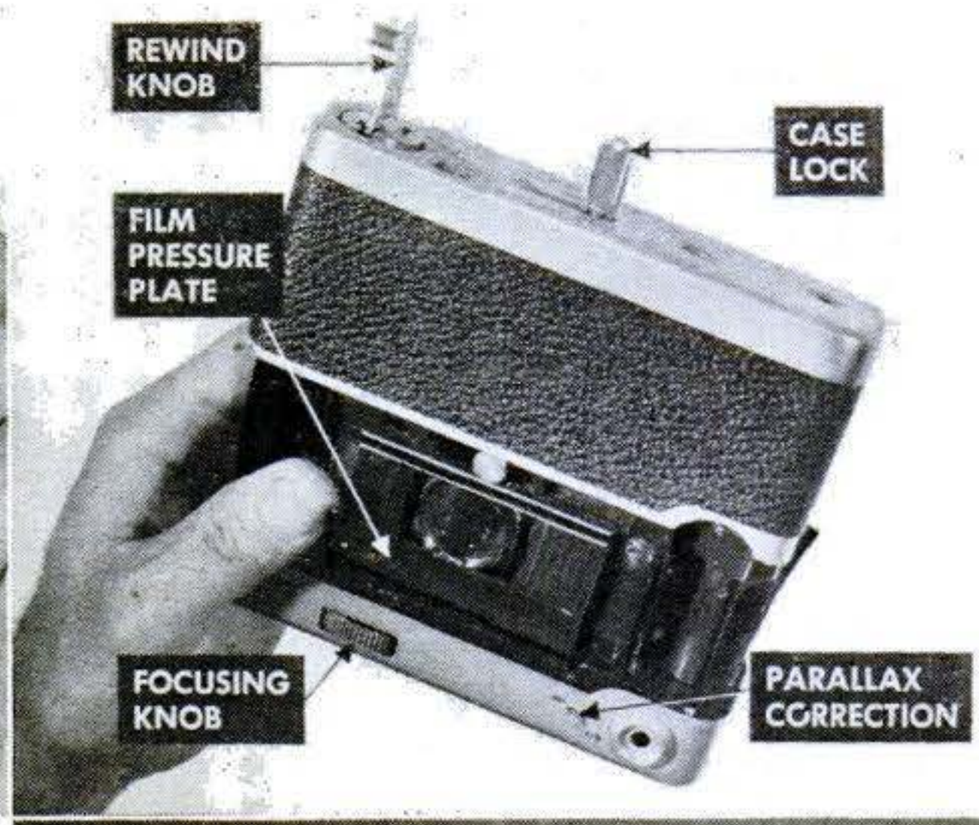
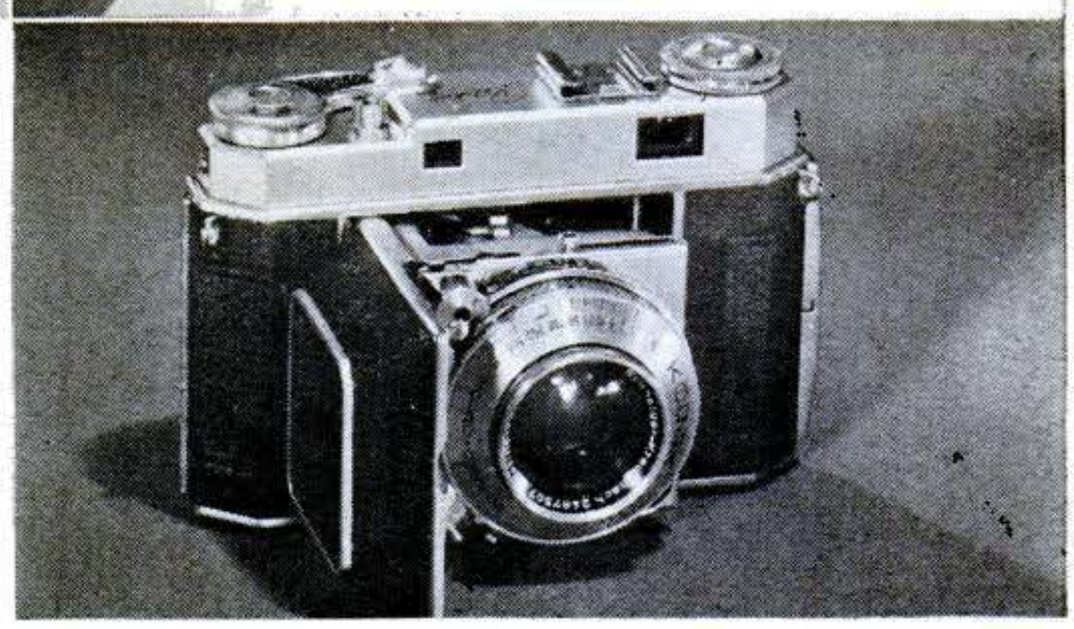






Imported Cameras Shoot Fast

SUPPOSE you wanted to photograph an old factory stack being blasted to the ground. How many pictures could you take while it was falling?

By alternately pressing two controls of the new Voigtlander Vitessa, shown in the two photos above, you could make a picture each second. The tall plunger cocks the shutter and advances the 35-mm. film. The other makes the exposure. Two doors fly open, bringing lens and shutter into position at the touch of another button. Willoughby's, New York City, is the distributor.

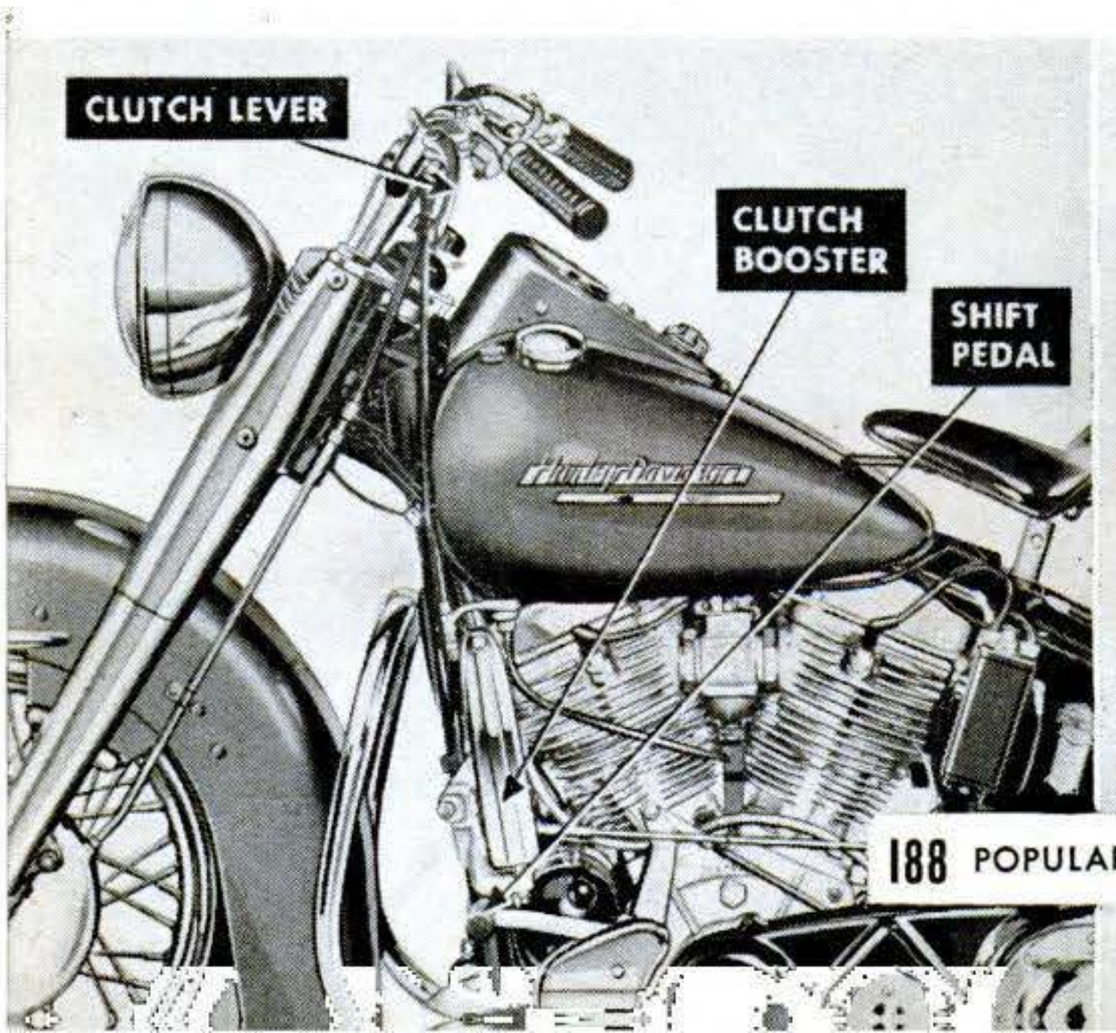
Rapid shooting is also a feature of the new Retina IIa (right) a 35-mm. camera imported and distributed by Eastman Kodak. Swinging a lever advances the film, cocks the shutter, sets the film counter and unlocks the body shutter release.

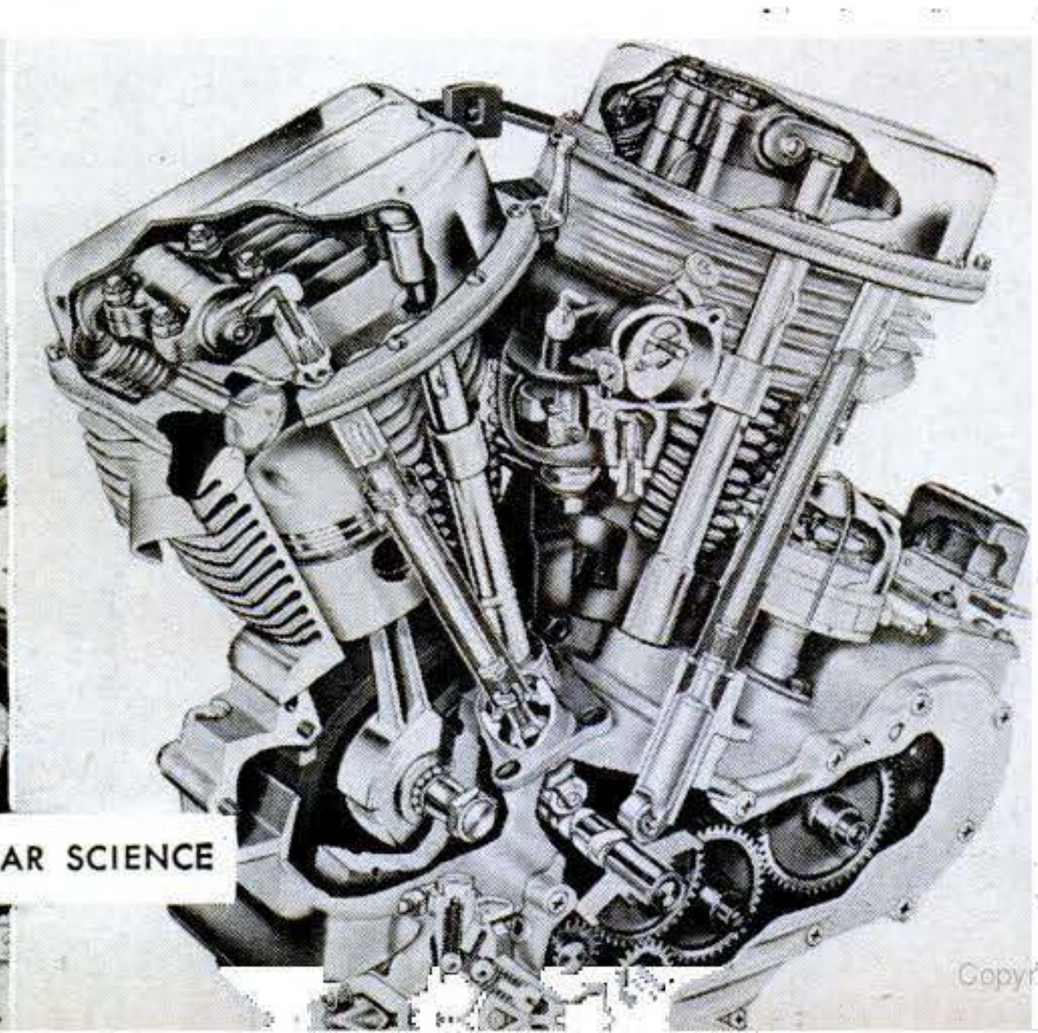
Both cameras have f/2 lenses, shutter speeds up to 1/500 second, and coupled range finders. The Retina has built-in flash synchronization. The Vitessa costs about $150, the Retina somewhat more.

Harley Offers Optional Foot Shift on Two New Models

A FOUR-SPEED foot shift on two new 1952 Harley-Davidson motorcycles lets you shift without taking your hand off the handlebars. Optional on the 61- and 74-cubic-inch overhead-valve models, the toe-operated pedal moves through low, neutral, second, third and fourth. Reverse is not available. A clutch lever is mounted on the handlebars. A booster spring helps the driver release the clutch.

Exhaust valves in the overhead-valve engines have been given an oil-absorbent phosphate coating. A new muffler is said to reduce back pressure.





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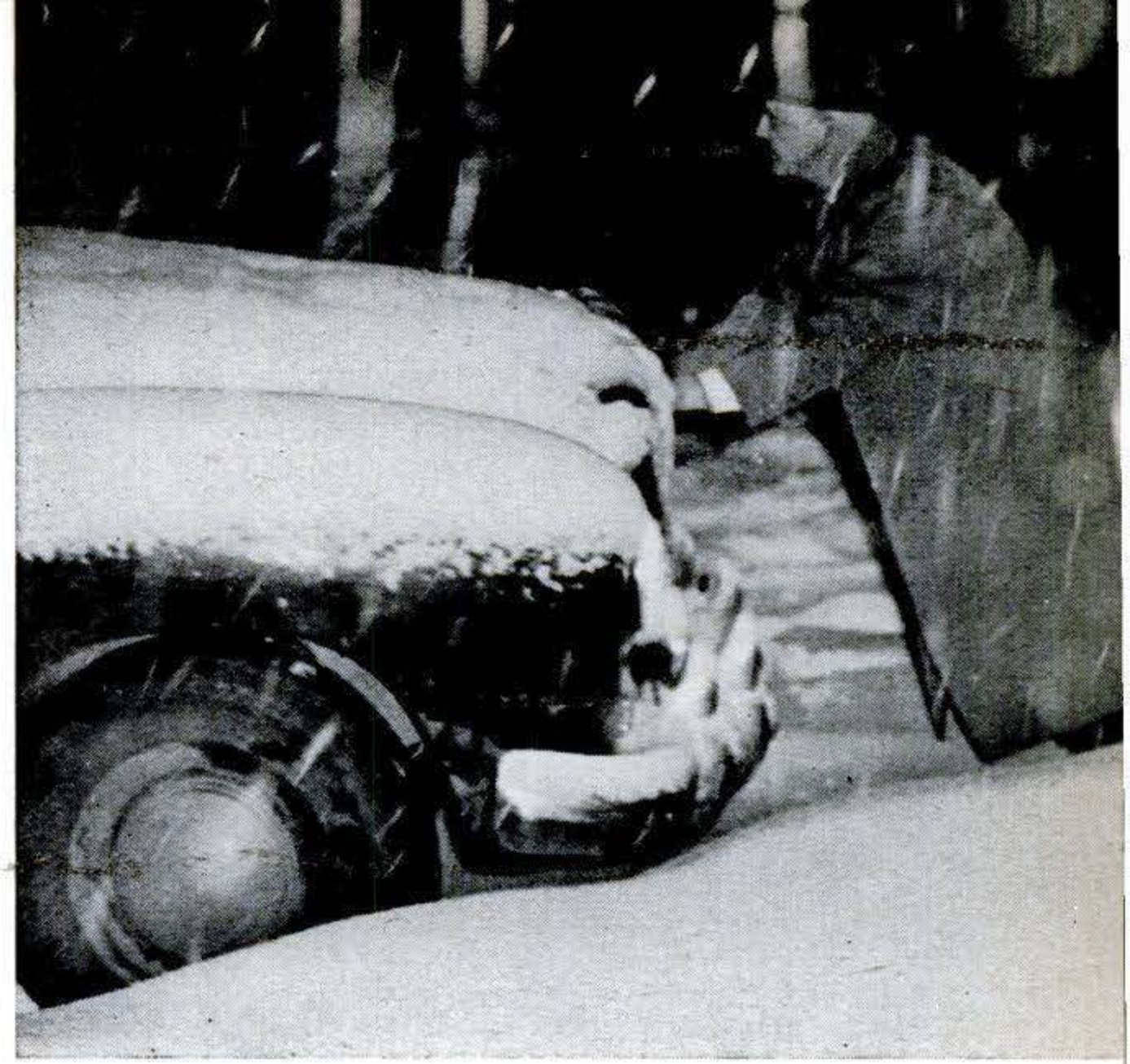
Starting Your Car in Zero Weather



It takes more than pushing a button to get a car going when the mercury drops out of sight.

By E. F. Lindsley

WHEN winter nights pull the rug from under the thermometer, will your car always kick off in the morning? Or will the starter give a few groans and lapse into dismal silence?

In my case, the questions hit right home. I live in Wisconsin, where the thermometer often dips to 20° below, so I jumped at the chance to round up information about winter starting for POPULAR SCIENCE.

What I have found out should help people with heated garages as well as the rest of us who aren't so lucky. That's because a car that sits in an open parking lot for hours can easily need first aid to get going again.

We'll take it for granted that before winter sets in you'll put your car in top mechanical condition, remembering such things as a lighter oil, a charged battery with sound tight cables, and clean spark plugs. If your engine is in good shape, knowing *why* cold engines are hard to start, and using starting techniques based on this knowledge, will usually get you on your way.

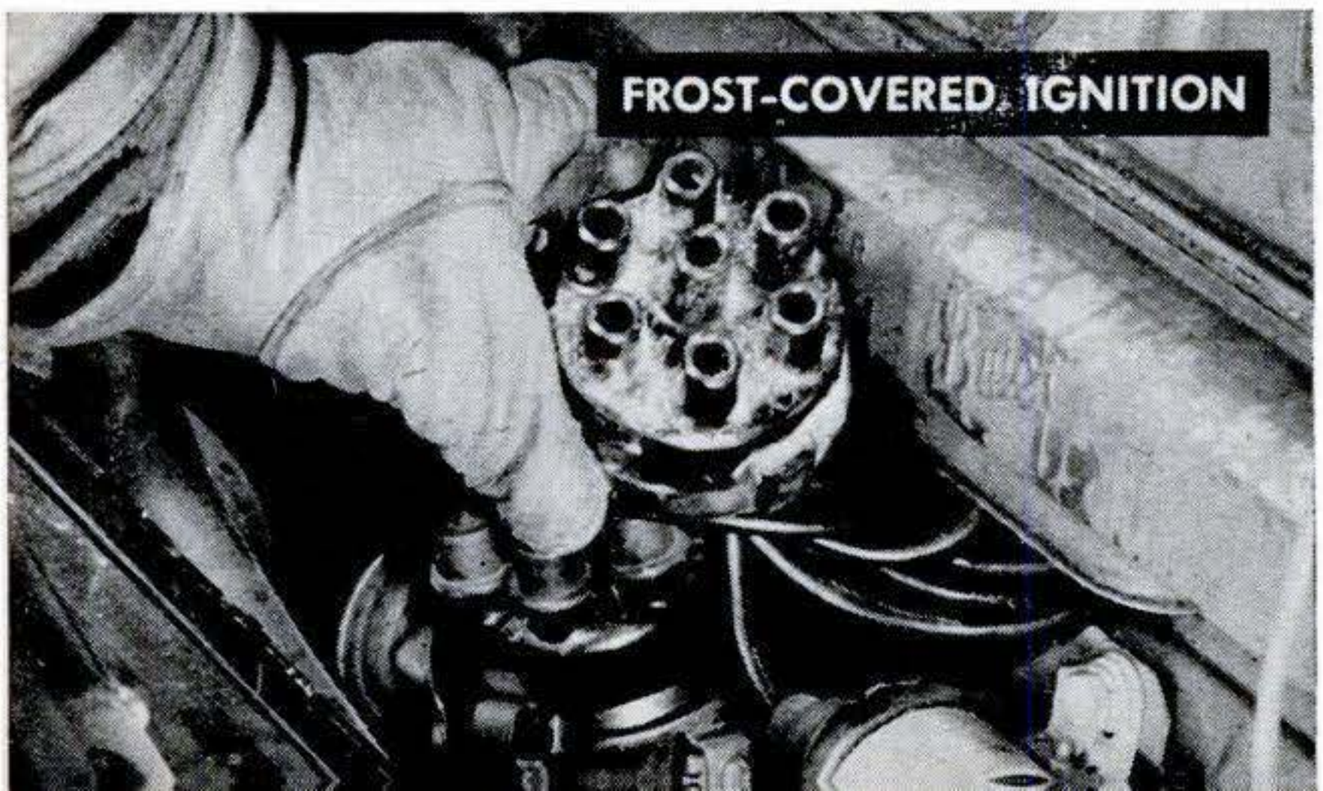
Why Cold Engines Are Hard to Start

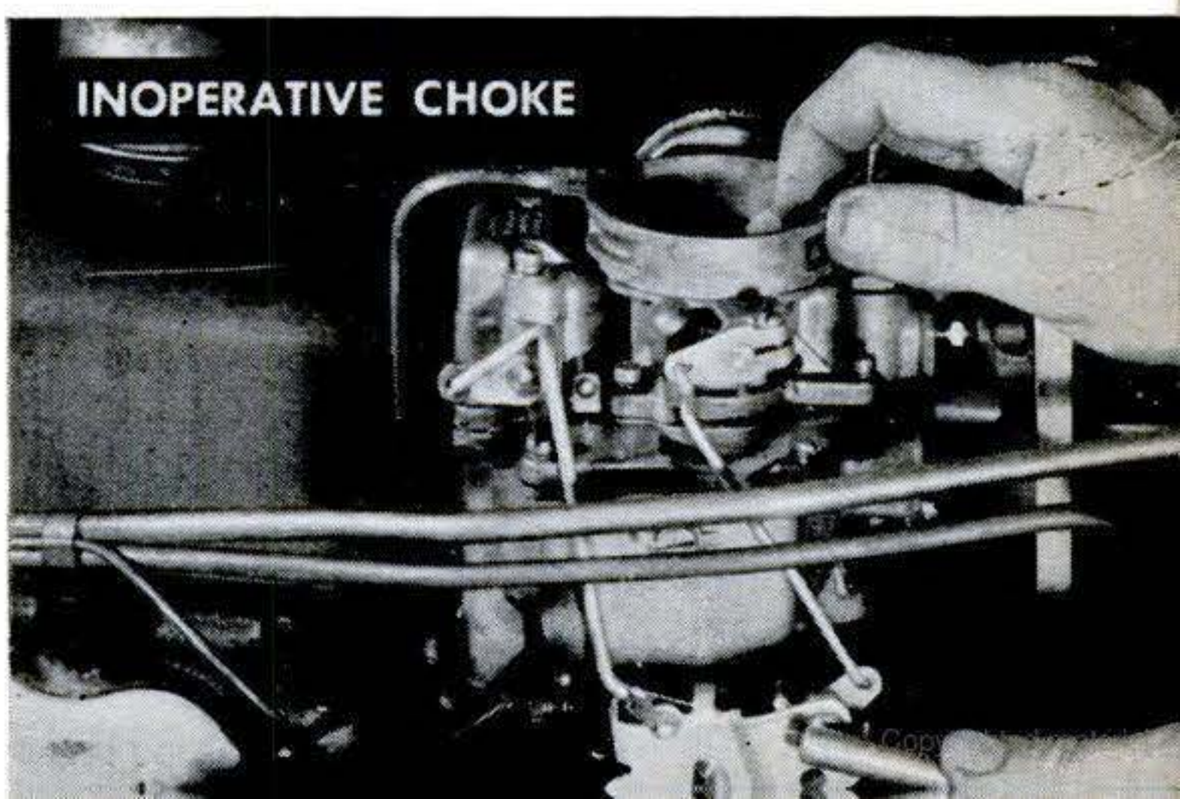
THERE are four basic reasons why a car is harder to start in periods of low temperature. First of all, congealed oil creates high internal friction, putting a heavy cranking load on the starter and battery.

This might not be so serious if the battery didn't lose a lot of pep in cold weather because its chemical activity is slowed down. The chart on the next page shows how serious this drop can be. If the thermometer goes low enough, even a fully charged battery is pretty feeble. Add to these two handicaps the tendency of gasoline to condense wetly on the manifold walls instead of entering the cylinders as a burnable vapor, and you have the root of the problem.

The fourth troublemaker is that in some unsuspected way the engine may not be up to snuff. For instance, frosted or snow-covered ignition parts will almost certainly impair starting, especially if ignition wires are cracked or rubber seal caps missing.

Or perhaps the linkage on an automatic choke may be so gummed up with varnish-

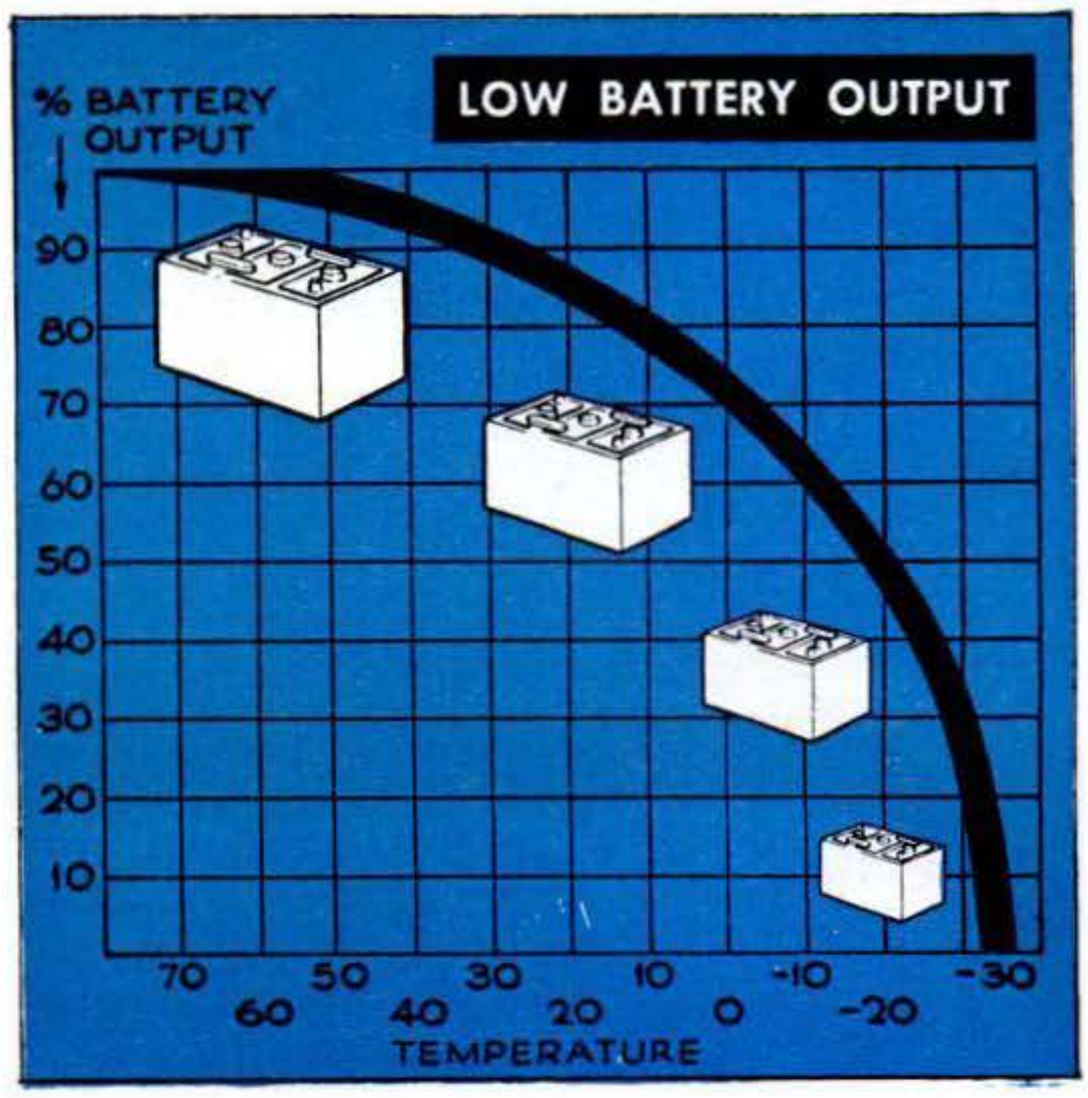




like fuel residues that the choke can't operate. These deposits should be washed off every 5,000 miles with lacquer thinner. Most other solvents won't work.

This is a job often overlooked in a fall tune-up for winter. When you look into it, check at the same time on the action of the choke unloader by having someone push the accelerator clear to the floor. Or you can pull the throttle rod wide open by hand. The choke butterfly should pop open. This is very important.

Modern cars with automatic chokes all have some kind of choke unloader. If an engine does not start after a reasonable interval of cranking, you use the unloader by holding the accelerator pedal to the floor while operating the starter for a few seconds.



How to Use Your Starter

STEPPING into your car in subzero weather, don't expect the battery to deliver more than half a dozen whirls of the starter. It may do better, but a pessimistic approach will help keep you from wasting what little output it is able to give. Remember it must do two jobs at once—turn over the cranking motor and supply juice to the coil.

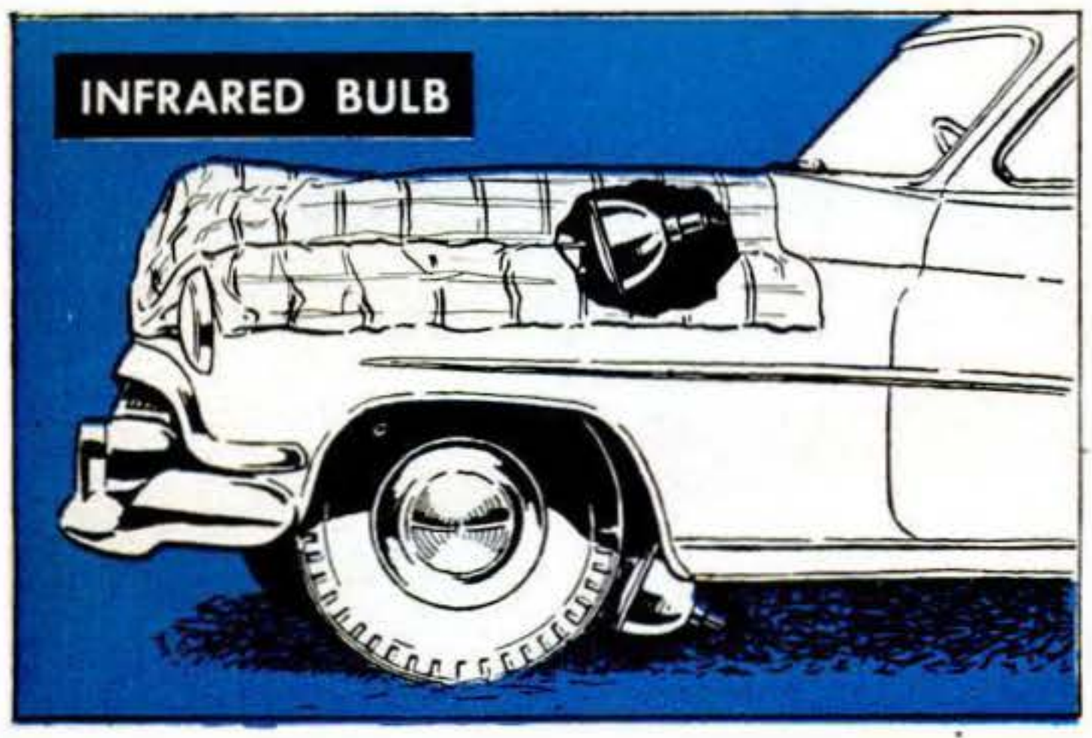
How to start may vary a bit from engine to engine and you'll have to learn what gives best results with yours.

Get ready before you hit the starter. Hold down the clutch pedal (if you have one) to take the transmission load off the engine. Apply the choke by pulling out the control if it is hand-operated. Depress and release the accelerator, then hold it partly down. (On some cars, pumping the accelerator two or three times to shoot gas into the carburetor throat is a definite help. On others, this will only get you into trouble. Your operator's manual or experience will show you which is best in your case.) Finally, turn on the ignition switch and hit the starter.

It's often best to operate the starter in bursts of about five seconds each. You will sometimes find that the engine kicks off just as you release the starter. This is because the battery at that split second can deliver hotter sparks at the plugs. If the engine fails to start in half a dozen starter bursts, use the unloader and try again.

When the battery lacks enough oomph to turn the starter, a push or rolling down a hill is always a good bet. The weak battery can then devote all its energy to delivering a good spark. Shift into high gear, not low or second, for this.

Here Are Some Simple Starting Aids



IF THE car is inside a garage or otherwise sheltered, one or two reflector-type infrared bulbs will do a good job of keeping the engine warm. Use them on an all-night basis.

An ordinary 100-watt bulb in a large tin can will also keep the oil moderately warm. Trim the can so it is a close fit under the deep part of the oil pan. In such extensions of your 115-volt system, be careful of shocks and shorts—calcium chloride, widely used to de-ice roads, makes a perfect electrical path when it drips on a garage floor.

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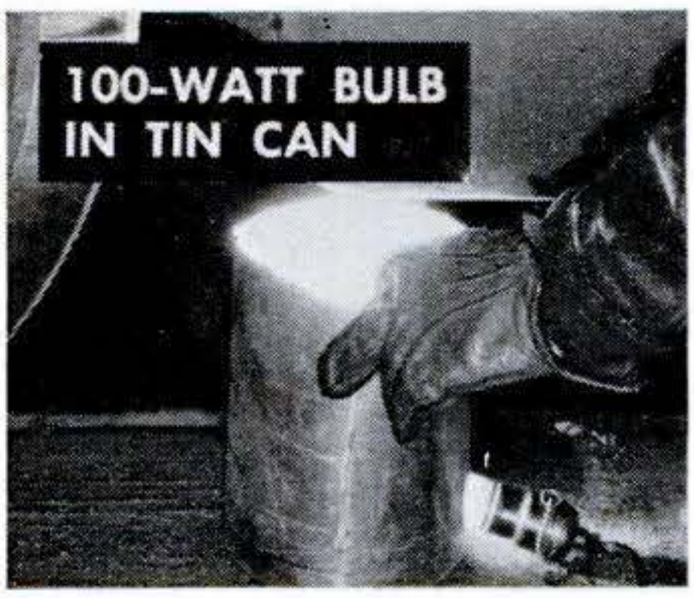
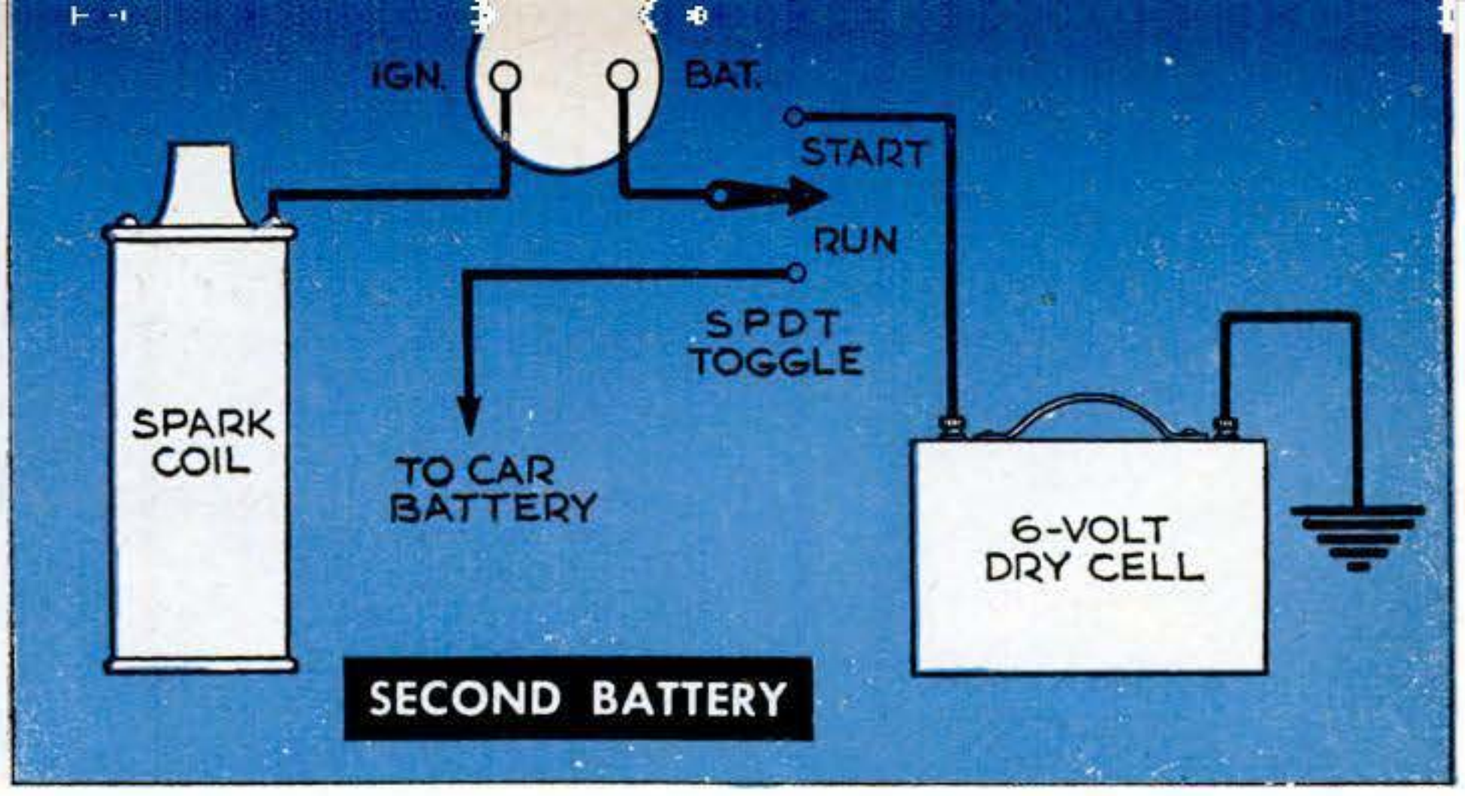




An extra six-volt battery with leads to be clipped on in parallel with the regular battery may be the solution to low cranking power. The accompanying sketch shows a neat permanent installation. Here, a six-volt dry-cell battery is used to supply juice to the ignition system during the starting period, freeing the regular car battery for the single job of cranking the engine. Throwing the switch after the car is running returns the load to the regular battery. If the extra battery is installed with easily disconnected leads, it can be kept in the house overnight. Thus kept warm, it will deliver more juice in the morning.

A trickle charger to keep the electrolyte in your battery active overnight is another practical idea. So is warming the battery.

Starting Aids That You Can Buy

BELOW and on the next page are some of the starting aids now on the market. One alone or a combination of several might help you out. First, though, you should be sure they meet the requirements of your car, taking into consideration the place where you keep it.

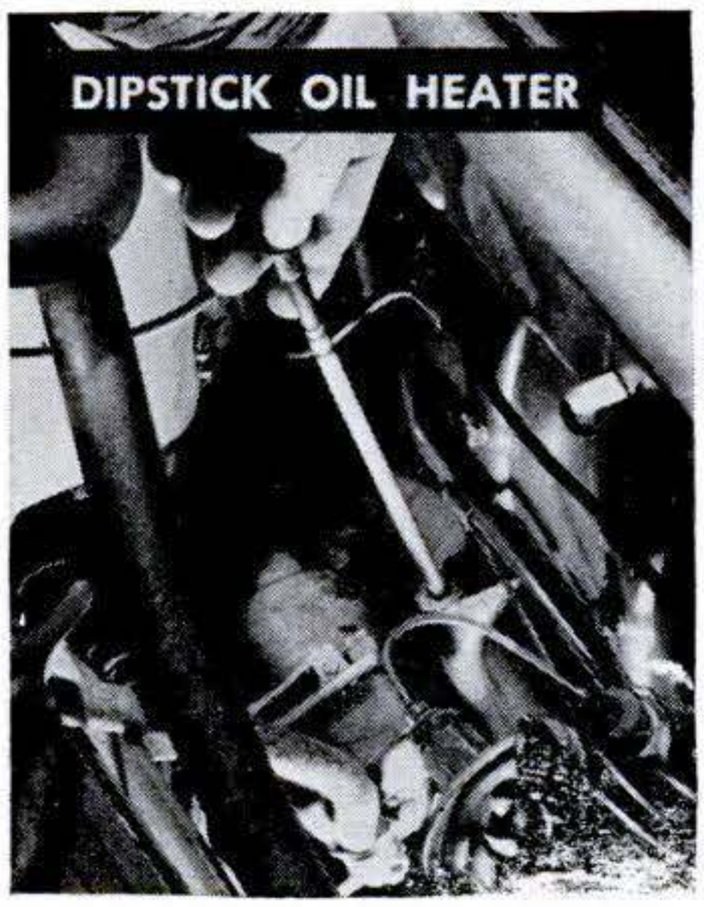
For instance, an electric heater at the end of a 200-foot extension cord will be too hampered by voltage drop to do its job. A water-jacket heater that really does the trick for a closely fitted new engine may not help an old car. A kerosene burner may be a disappointment if water-white kerosene is hard to find.

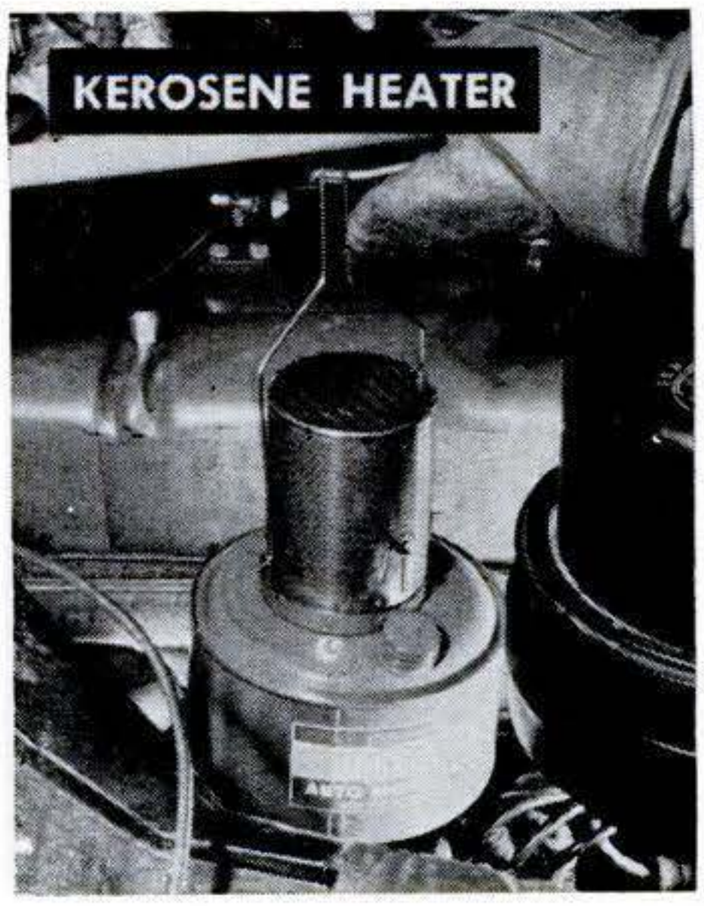
A headbolt heater is mounted permanently in the engine water jacket. It comes in sizes to suit all modern cars, but checking is necessary to be sure the water jacket is clear under the bolt opening you select. An extension cord plugs on the heater head.

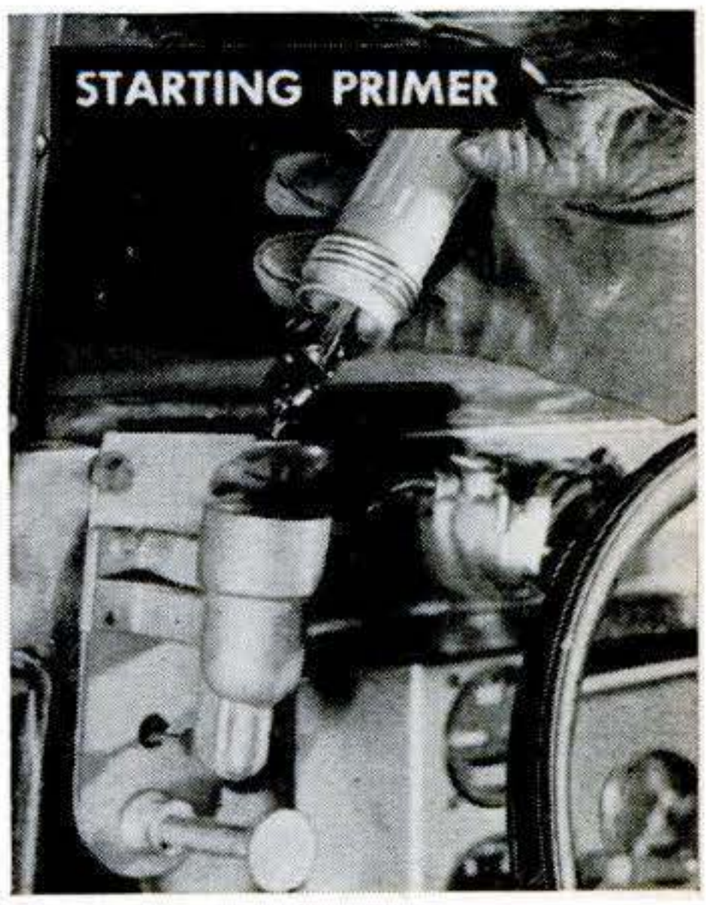
A Calrod water heater goes inside the water inlet hose and an electrical lead runs to a receptacle mounted somewhere on the grille. Hook up a 115-volt extension cord and it goes to work.

If yours is a V-8 engine with two water inlets and two outlets, two headbolt or two hose heaters will do a better job—although one is usually enough.

Less expensive than permanently installed jobs, an oil-immersion heater inserted in the gauge hole will keep the oil at startable temperature while the car is garaged overnight. It is not recommended, however, for bringing a completely cold engine up to starting temperature. This type of heater might be used in conjunction with a water heater







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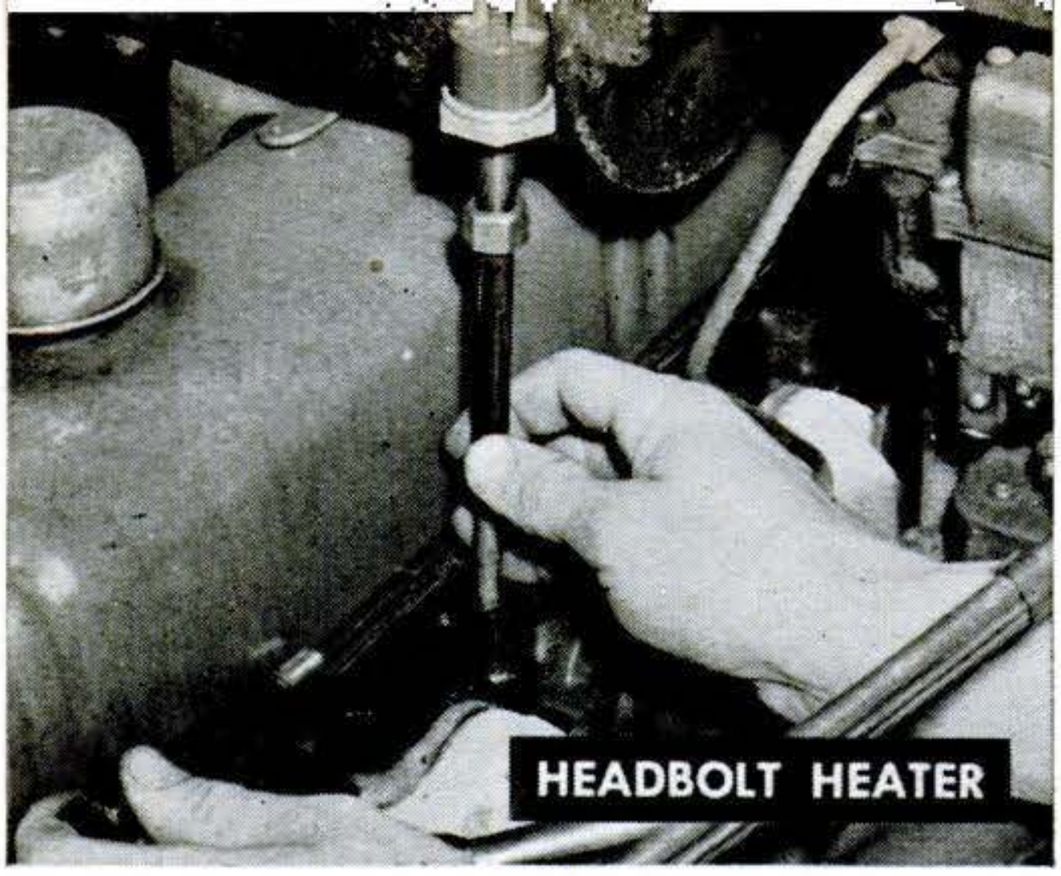
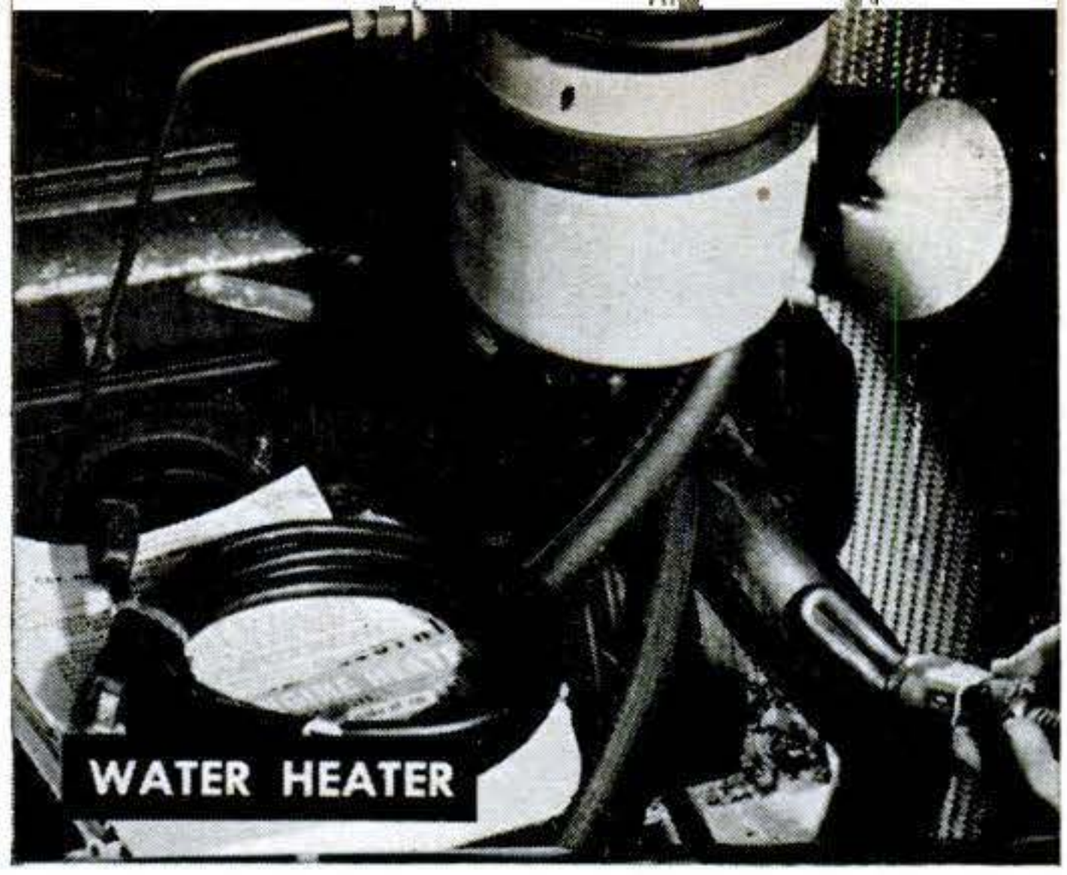

HEADBOLT HEATER


WATER HEATER

since the latter may not warm the oil very much.

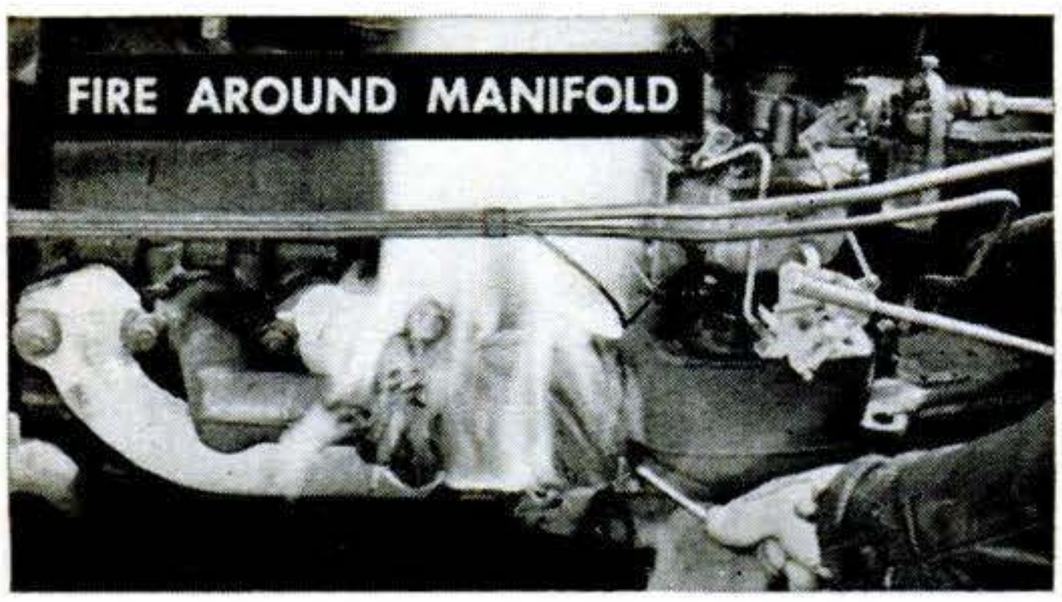
Designed to help vaporize cold fuel, a carburetor preheater includes a heating element mounted in the fuel passage between the carburetor and intake manifold. This heater is switched on for a few seconds before the starter is engaged.

Another way of giving the fuel a shot in the arm is to use a Chevron starting primer. This gimmick punctures a gelatin capsule filled with a highly volatile ether-base fuel, and a nozzle sprays the fuel into the intake manifold. A new capsule is required for each starting attempt. These are most useful with updraft carburetion and manual chokes.

For cold-weather operation, a gas-tank antifreeze is always a wise purchase. Ice in the fuel lines or carburetor is a pretty common problem.

CARBURETOR HEATER

Strictly for Emergencies!


FIRE AROUND MANIFOLD

FIRE UNDER OIL PAN

SOMETIMES, getting started may be a life-or-death matter. A car stalled in a remote spot in severe cold is no place to spend the night. Such a situation may call for drastic methods. Building a fire in the right place has been known to start a stubborn mule. If you must, you can do the same with a car.

Oil-soaked sand, asbestos or rags ignited in a hub cap and pushed under the engine will warm up the oil pan. Unless gasoline leaks are present, this is not particularly dangerous. Keep flames away from wires or hoses.

In conjunction with a fire under the oil pan, you could burn oily rags along the intake manifold to vaporize the fuel enough to get you started. Don't be alarmed if small flames play around the edges of the carburetor, but keep the fire away from wiring and rubber fuel or heater lines. A shovel of snow will douse the fire quickly. END

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An Engine to Dream About

WHAT kind of car engine would *you* build if you had the technical resources of General Motors at your disposal? That's a question several GM engineers no longer have to wonder about.

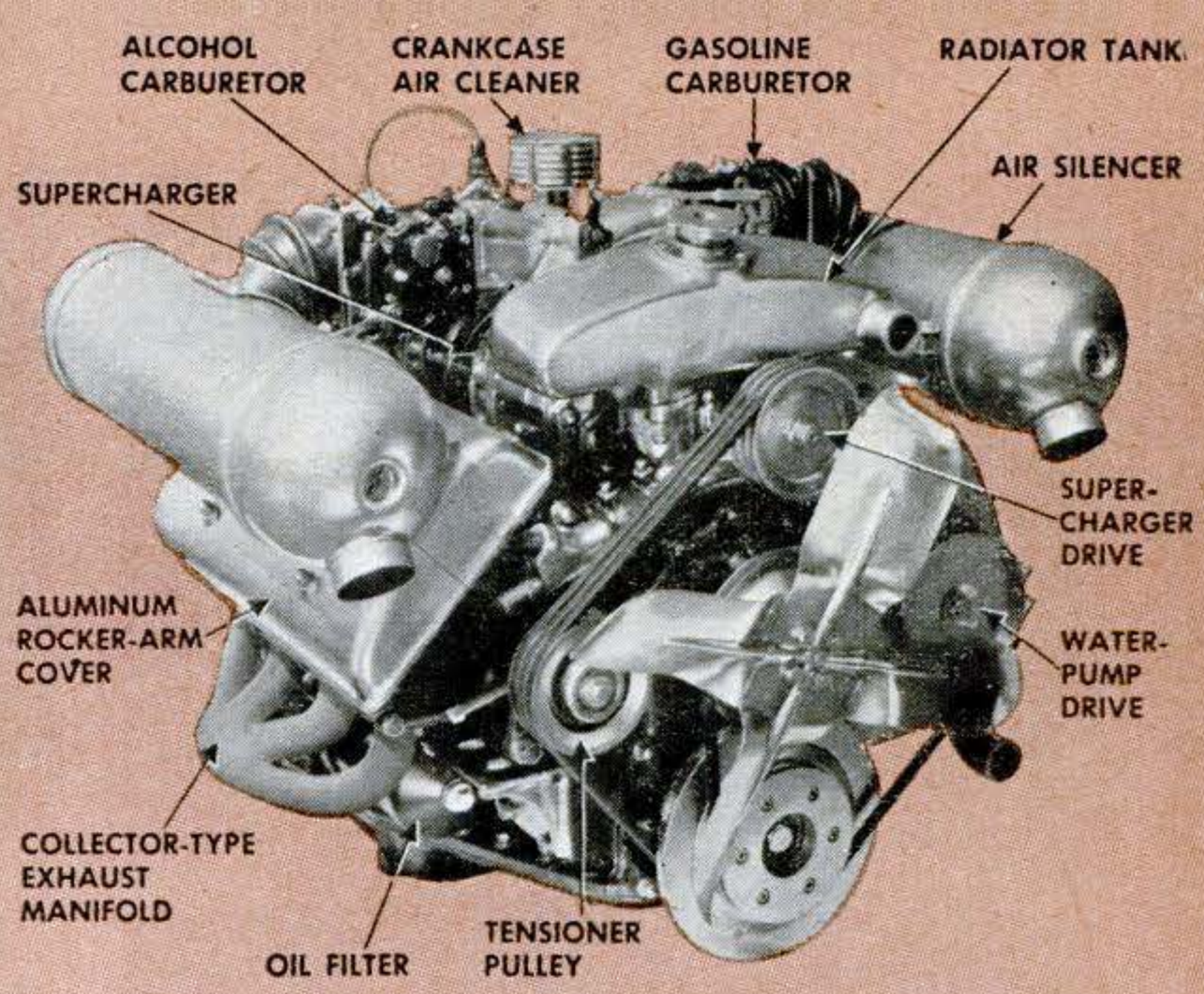
They designed and built this engine for two General Motors experimental cars—Le Sabre (pictured above and described in PS, Feb. '51, p. 130) and Buick's dream convertible (PS, April '51, p. 111). Like the cars, the engine won't go into production, but will undoubtedly influence future models.

A supercharged V-8, the engine has two aircraft pressure carburetors to ram in the fuel—premium gasoline at low engine speeds and methanol when it revs up toward its peak. A Roots-type supercharger nestled between the 90° cylinder banks whips up a manifold pressure of 18.2 pounds per square inch at 5,000 r.p.m.

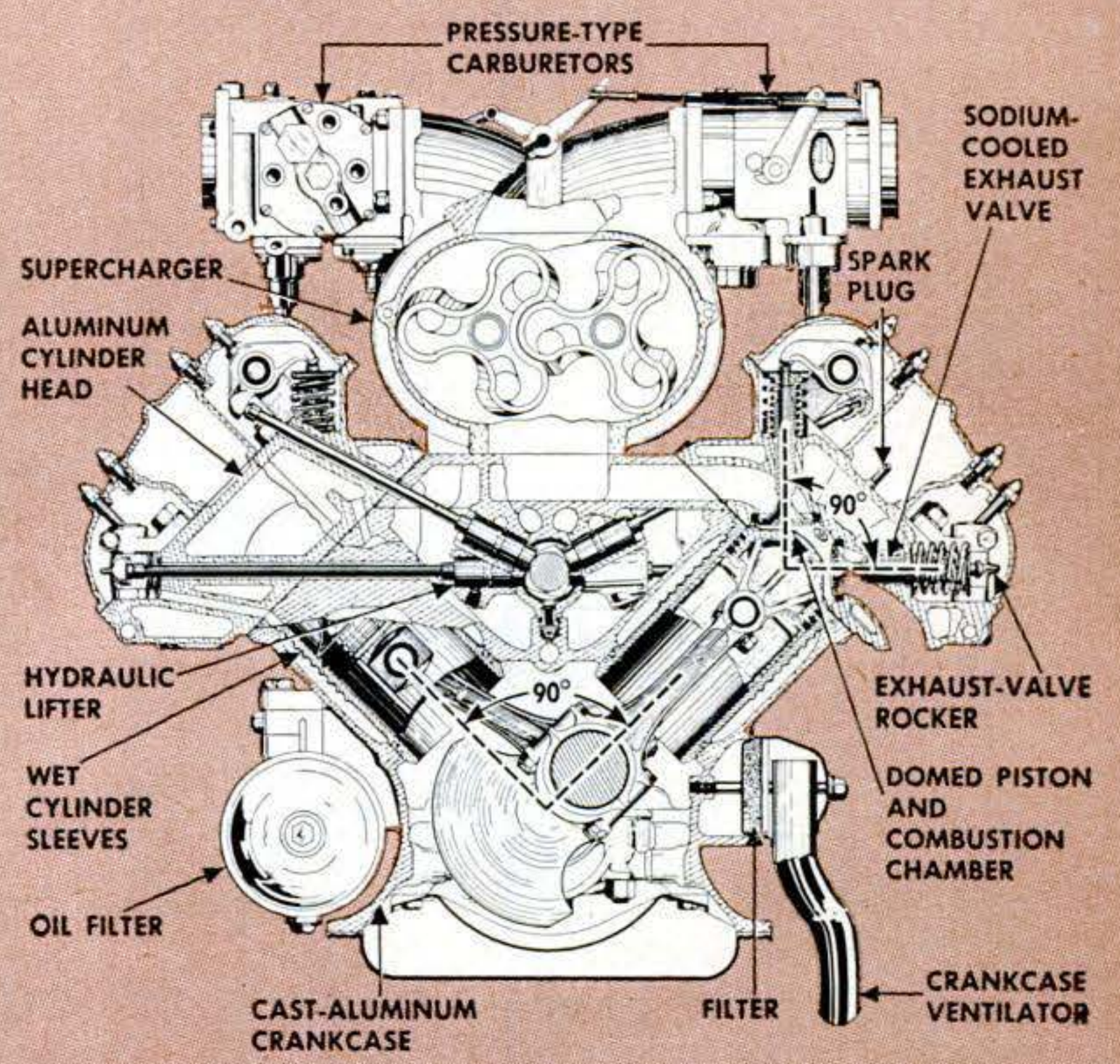
Methanol Really Makes Her Hum

Despite a compression ratio of 10 to 1, the gasoline carburetor gives satisfactory operation with premium gasoline while the engine is developing less than 125 hp. The methanol carburetor comes into action when the gas-carburetor throttle is nearly wide open.

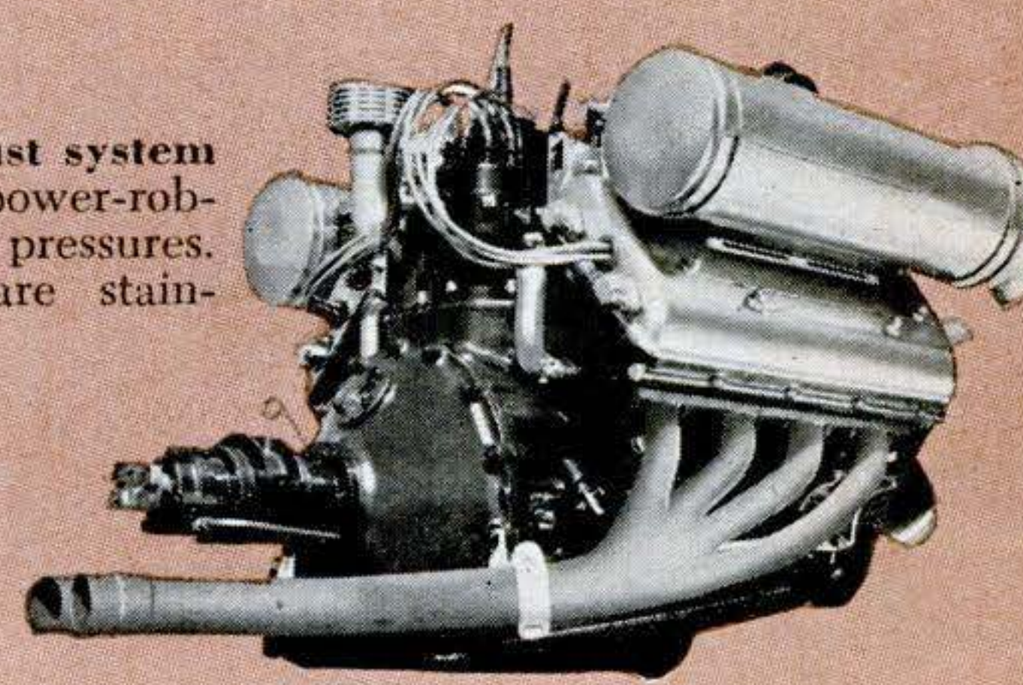
The designers shot for a power maximum of 300 hp.—and that's how the engine has been billed. Actually, in dynamometer tests, its output has been as much as 335 hp., a very creditable figure for a weight of only 550 pounds and a piston displacement of 215.7 cu. in.



Where's the generator? You won't find one on this engine. Instead, it is located at the rear of the car, and is belt-driven off the propeller shaft. Radiator tank is mounted on engine, core ahead of it.



It's a "square" engine, the bore and stroke both being equal—3¼". The exhaust-valve push rods operate through passages drilled between the cylinders. Their rockers work on individual short shafts.



Dual exhaust system cuts down power-robbing back pressures. Manifolds are stainless steel.

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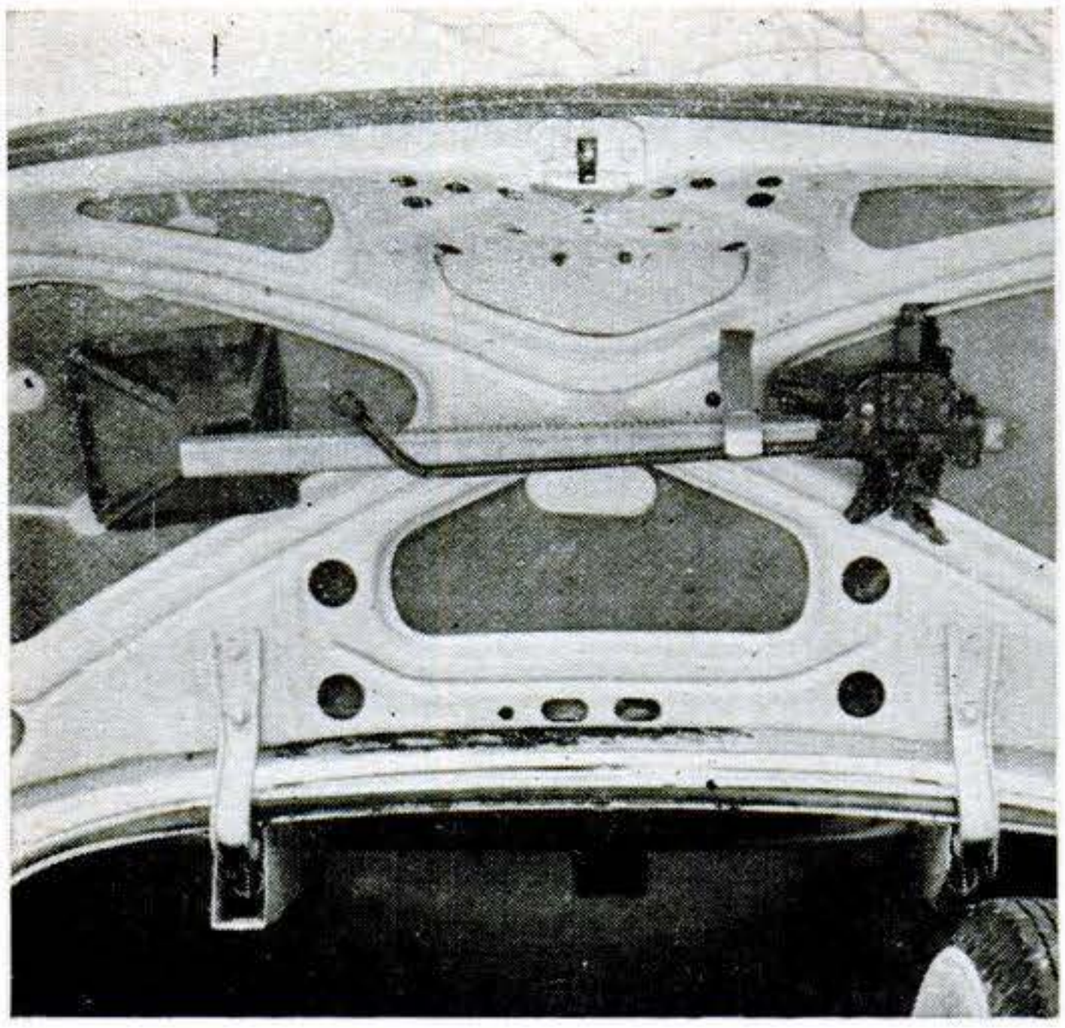
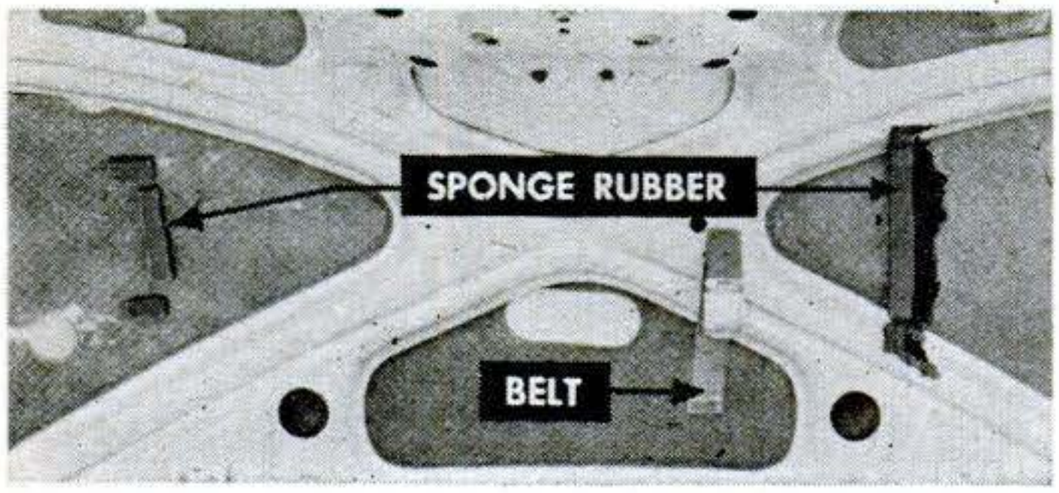
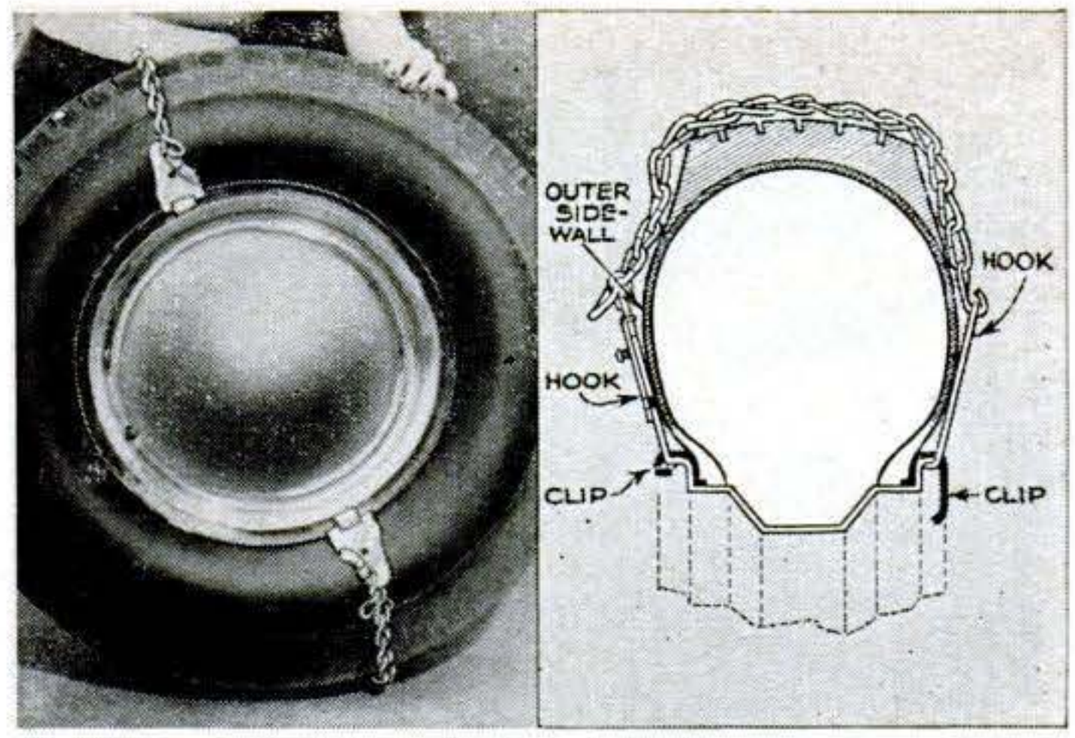


Jack Mounted Under Trunk Lid

THE only place allotted for the jack in most cars is the floor of the trunk, where it rattles. I carry mine as shown above. A surplus army web belt, attached with sheet-metal screws (below), keeps the jack parts snugged up against noise-deadening sponge rubber. This location is handy if you need the jack while the trunk is full of luggage. A snow shovel can also be carried the same way.—*L. L. Peterson, Lewistown, Mont.*





Emergency Chains Clip on Rims

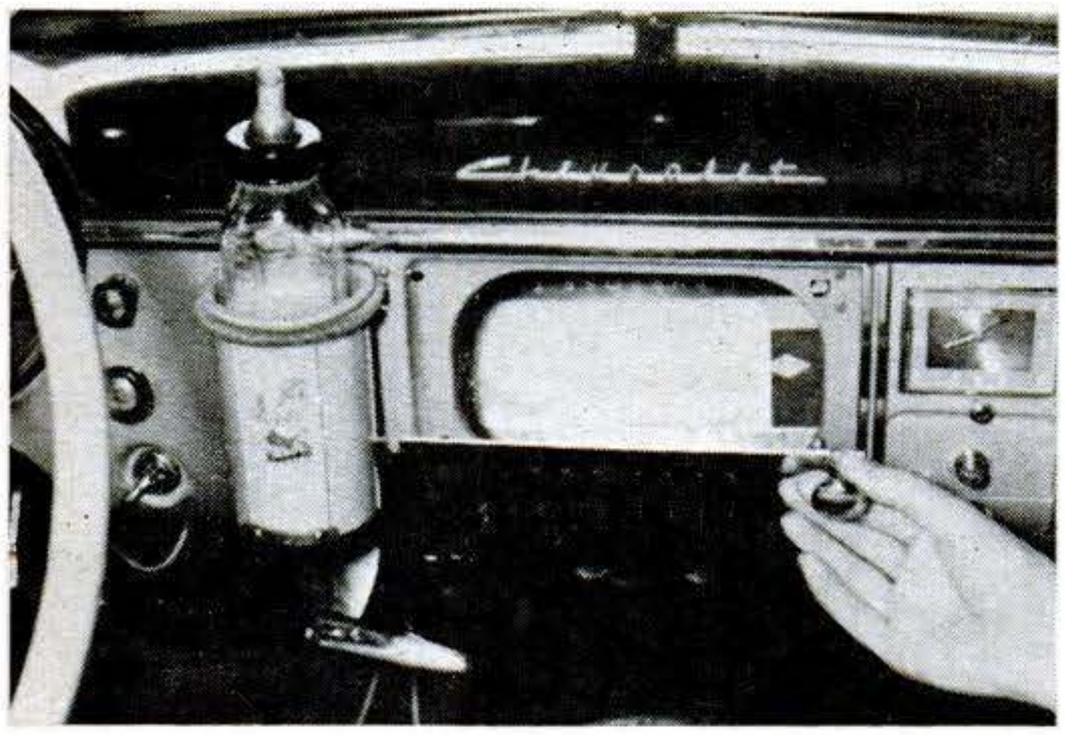
RETAINING clips for these new emergency chains are permanently mounted on the wheel. They're put in place by deflating the tire, breaking the bead and slipping them between bead and rim—two on the inner side of the tire, two outside. When chains are needed, a hook attached to the cross chain is slipped on the inside clip. A spring lock on the outside hook makes it possible to take up slack. Mounted directly opposite each other, the clips are said not to affect wheel balance. Presto Chain Company, Des Moines, is the manufacturer.

Antifreeze Can Mar Finish

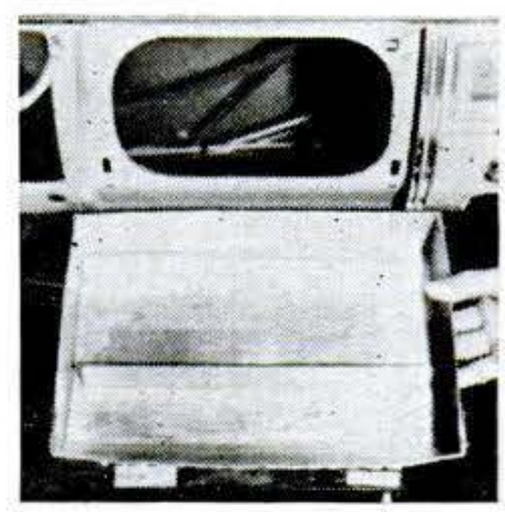
ANTIFREEZE dripping on the fenders or hood of a car may spot the paint. An easy way to prevent the spotting is to wash the area with a mild detergent and water.

Area Behind Unused Radio Grille Offers Storage Space

IN CARS without a radio, the space behind the grille can be used to store overflow from the glove compartment. The photos show how Arne O. Salonen of Raymond, Wash., handled this conversion in his car.



He screwed small brass hinges to the bottom of the grille, put a friction catch on the top edge and attached a knob outside for easy opening. Limit chains support the grille when open. Inside the opening he mounted a shallow pan formed from sheet aluminum. This was dimensioned especially to hold a box of tissues standing on edge so the box opening would face outward. As a companion project, he mounted a baby-bottle warmer on the radio control panel at left of grille.



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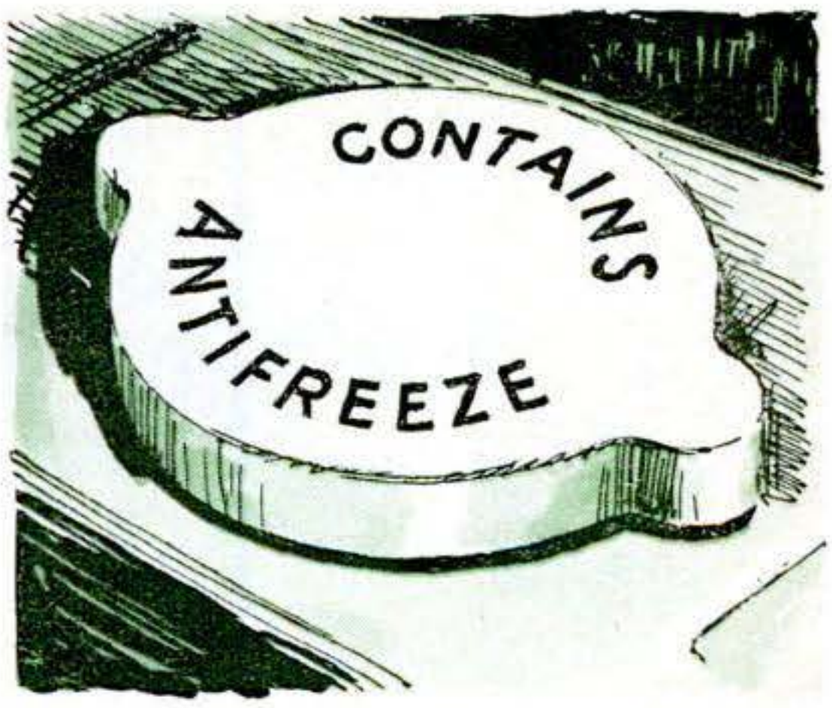
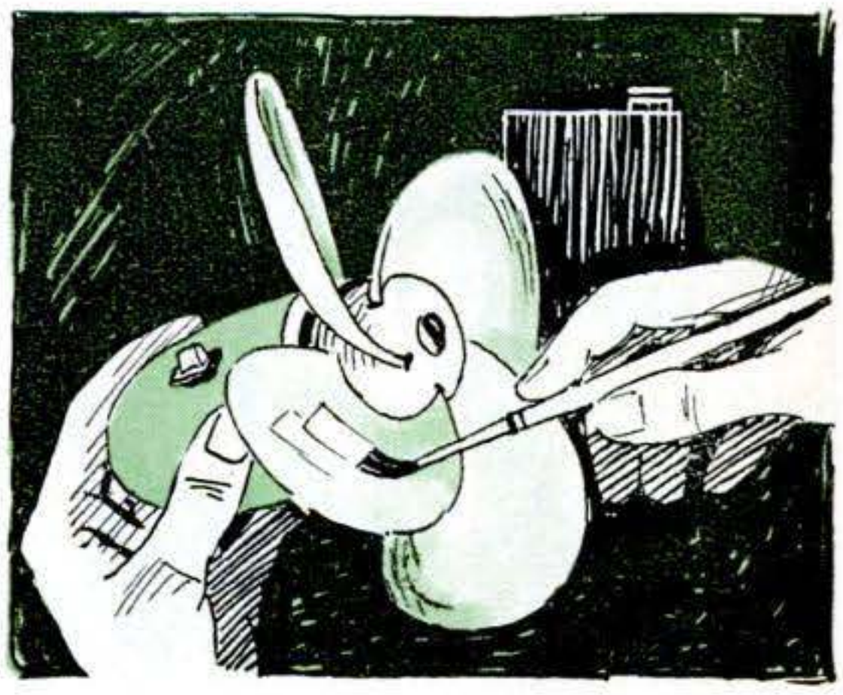
Winter Motoring Tips

Shield the Radiator. A large paper shopping bag pressed flat makes a handy shield when you want to warm up fast or prevent a radiator freeze-up while driving. Slip it down in front of the core. Put cord through one end of the bag and tie it to the radiator cap.

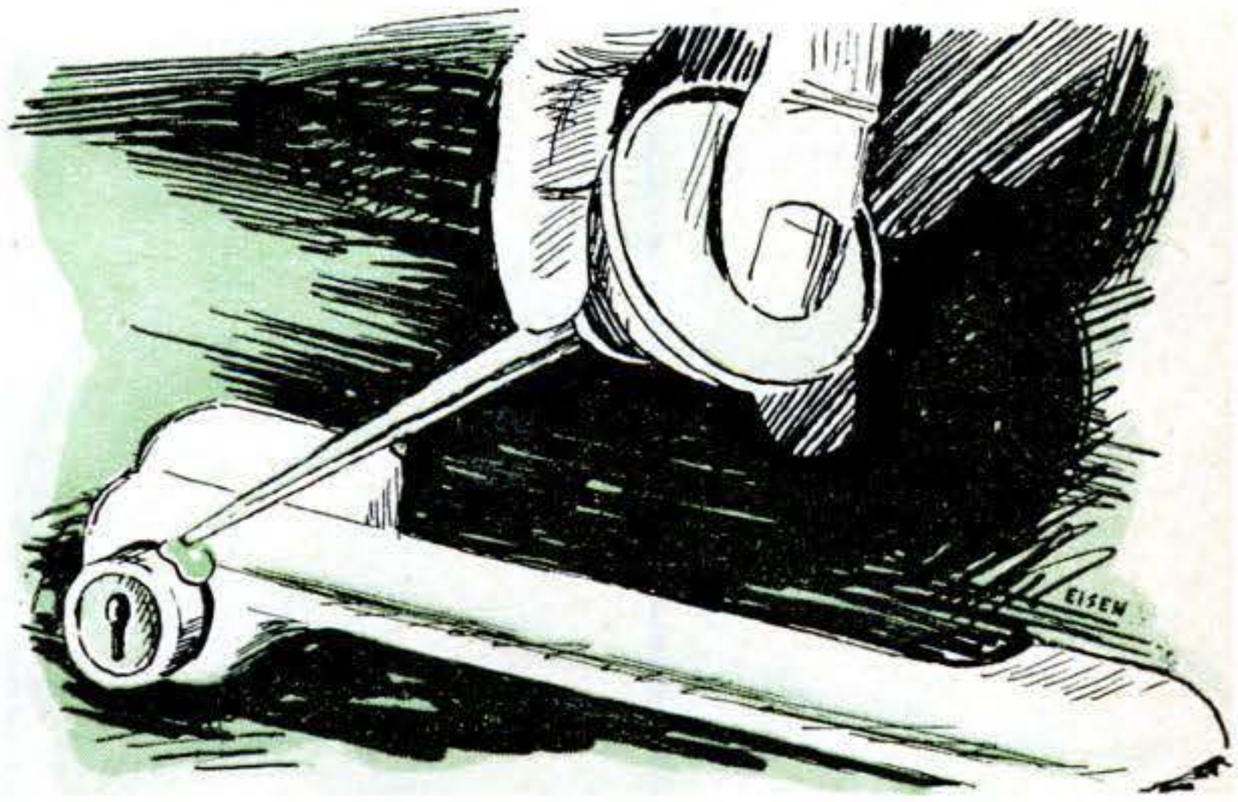


Protect Your Antifreeze. To keep a careless mechanic from draining off your costly antifreeze, you may want to buy an extra radiator cap and paint a warning notice on it as shown. It's better than the conventional tag, which frequently is torn off and lost.



Preserve Defroster Blades. Rubber defrosting fans can be kept pliable by brushing on a little rubber lubricant. Get the kind used with rubber spring shackles.

Spring Saves Tester Tubing. The tubing of an antifreeze tester gets a lot of abuse, especially in a large shop. To protect it, slip on a snugly fitting flexible coil spring. This will help prevent a break by keeping the rubber from being folded sharply.



Avoiding Frozen Locks. To lessen the chance that a door-lock push button may freeze, use an oilcan to squirt in a solution of carbon tetrachloride (95 percent) and paraffin (5 percent). Do this while locks are dry and at normal temperature. If your car has the door lock in the handle, slip a rubber-glove finger over it on wet days to keep out moisture

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Gus Gives the Air Force a Lift

Airman Crawford was at the end of his rope—and a frayed one at that—when he was towed into the Model Garage with mysterious car trouble.

By Martin Bunn

GUS WILSON had just finished with a gas customer and was hooking the hose nozzle back up on the pump when Stan Hicks, his young helper at the Model Garage, called to him.

"Hey, Gus, look what's coming."

Gus recognized the mile-weary old sedan that Silas Barnstable, our town's best-known penny pincher, called a car. Behind it, at the end of a frayed tow rope, was a maroon coupe.

"Going into the towing business, Silas?" Gus kidded as Barnstable brought his caravan to a stop in front of the repair shop.

"Now none of your sarcasm, Gus Wilson. Ain't it enough I'm bringing you a cash customer?"

At this point, the door of the coupe popped open and a good-looking young man in the blue uniform of the Air Force slid out from behind the wheel.

"This here's my nephew, Dale Crawford. One of them Air Force fellers. Been visitin' over to my house for a spell."

Gus shook the boy's hand. "Glad to meet you, Crawford. Didn't know this dried-up old horse trader had any relatives that would admit they were kinfolk."

The Air Force Won't Wait

Silas ignored the remark.

"Got car troubles," he said, jerking his head toward the coupe. "Ain't got much time either. Got to report or somethin' tomorrow night. But mind you, we're not paying you any fancy bills for hurry-up repairs."

Gus grinned. He was used to haggling over prices with Silas. He'd been doing it for years. But he had an unexplainable liking for the old codger in spite of his miserly and cantankerous ways.

"You see, Mr. Wilson," young Crawford explained, "I just finished my basic training and stopped by to visit Uncle Silas for a few days on my way south—the base I'm assigned to is around 800 miles from here. I'm due there by midnight tomorrow and I'd expected to get an early start this morning but—"

"But your car wouldn't start," put in Gus.

"Oh, it started okay, but when I gave it the gas the engine rolled and vibrated like it was going to jump right out of the car."

"Shuddered like a sick cow," said Silas. "I made him shut it off."

No Trouble at All

When Gus and Stan had pushed the ailing car into the shop, Gus lifted the hood and began checking the motor mounts. "Had some work done on it recently?"

"Yeah, had it tuned up just before I left. One of the grease monkeys at the field picks up a little spare change by making car repairs."

"Had any troubles?"

"Not a one. Driving down here to Uncle's she breezed along like a well groomed T-6. That's a training plane," he added in answer to Gus's puzzled look.

"Well, let's start her up," suggested Gus, standing beside the opened hood.

The engine caught immediately. "You see, Mr. Wilson, she idles fine. Now watch what happens when I rev her up."

As Dale pushed down on the accelerator

When Gus pulled up in front of Silas' house, he found Crawford and Barnstable standing helplessly beside the opened hood.

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the engine roared, but there wasn't a sign of roll, buck, miss or vibration.

"It's fixed!" shouted Silas gleefully. "And Gus, don't you start figurin' on collectin' for work you didn't do."

"I can't understand it, Mr. Wilson," Dale Crawford said, as he let the engine idle again and then raced it just as he had before. "When I started to leave Uncle Silas' house this morning you'd have thought that engine was trying to shake itself loose from its moorings."

By this time, Silas had the repair shop doors swung wide and was shouting at his nephew to back the coupe out of the shop.

"What're you waitin' for, son? She runs fine, don't she? You can stop at the house to pick up that box lunch I packed for you and git along on your way."

Engine Refuses to Misbehave

Young Crawford hesitated for a moment, gunning his car's engine and looking quizzically at Gus. Then he slowly backed his car out of the shop.

"Well that's a hot one," said Stan as the two cars headed back down the road to town. "It's not like old Silas to imagine trouble, particularly when it might cost money. What do you suppose happened?"

Gus shrugged. "One of those on-again, off-again troubles, I guess. For the kid's sake, I wish I could've checked it a little more."

Half an hour later, the phone in the garage office rang.

"That was Silas," Stan called out. "His nephew's car is acting up again and he wants you to come right over. Said he's even afraid to tow it this time."

"If it weren't for young Crawford, I'd let the old goat stew in his own juice," grumbled Gus. "Where are they?"

"Parked over in front of Barnstable's house. Want me to go?"

"No, I'll go. You take care of things here."

When Gus pulled up in front of Silas' house on the other side of town, he found Dale Crawford and Barnstable standing helplessly beside the opened hood. The engine was running.

Gus Gets His Wish

"She's acting up again," Dale said glumly as Gus walked up to the car. "We got back here fine—no trouble—but when I started her up again and fed her the gas to get going she began to vibrate and shake worse than she did before. Watch."

Sure enough, when Dale accelerated it the engine rolled and rocked so badly that it vibrated the whole car.

"Shut it off," called Gus. "No sense straining the mounts. I'll tow you back to the garage."

"Gosh, now I'll never make the base on time."

"We'll try to get you on your way as fast as we can."

Stan Hicks had a wide grin on his face when Gus in the wrecker, with Silas bringing up the rear in his old rattletrap, towed young Crawford's car into the shop. "Well, you got your wish," he quipped.

Gus said nothing, but went right to work. His first hunch was that something had gone haywire either with the vibration dampener or the flywheel, but when both proved to be in order he turned his attention to the ignition. He checked spark plugs, ignition wiring, distributor and coil.

—And Spots His First Clue

"See you've got a fairly new battery."

"Brand-new," replied Dale. "My old one was slowly pooping out so Uncle Silas took me to a cut-rate place down in the city yesterday and I bought that one."

Gus grunted. "Still trying to buy gold in bargain basements, aren't you, Silas?"

"There's no law against a man saving a little money, is there? Looks like any other battery to me."

Gus started to make some comment about how looks are only skin-deep. Instead he told Dale to start his car.

"She sure runs smoothly at idling," Gus

[Continued on page 242]

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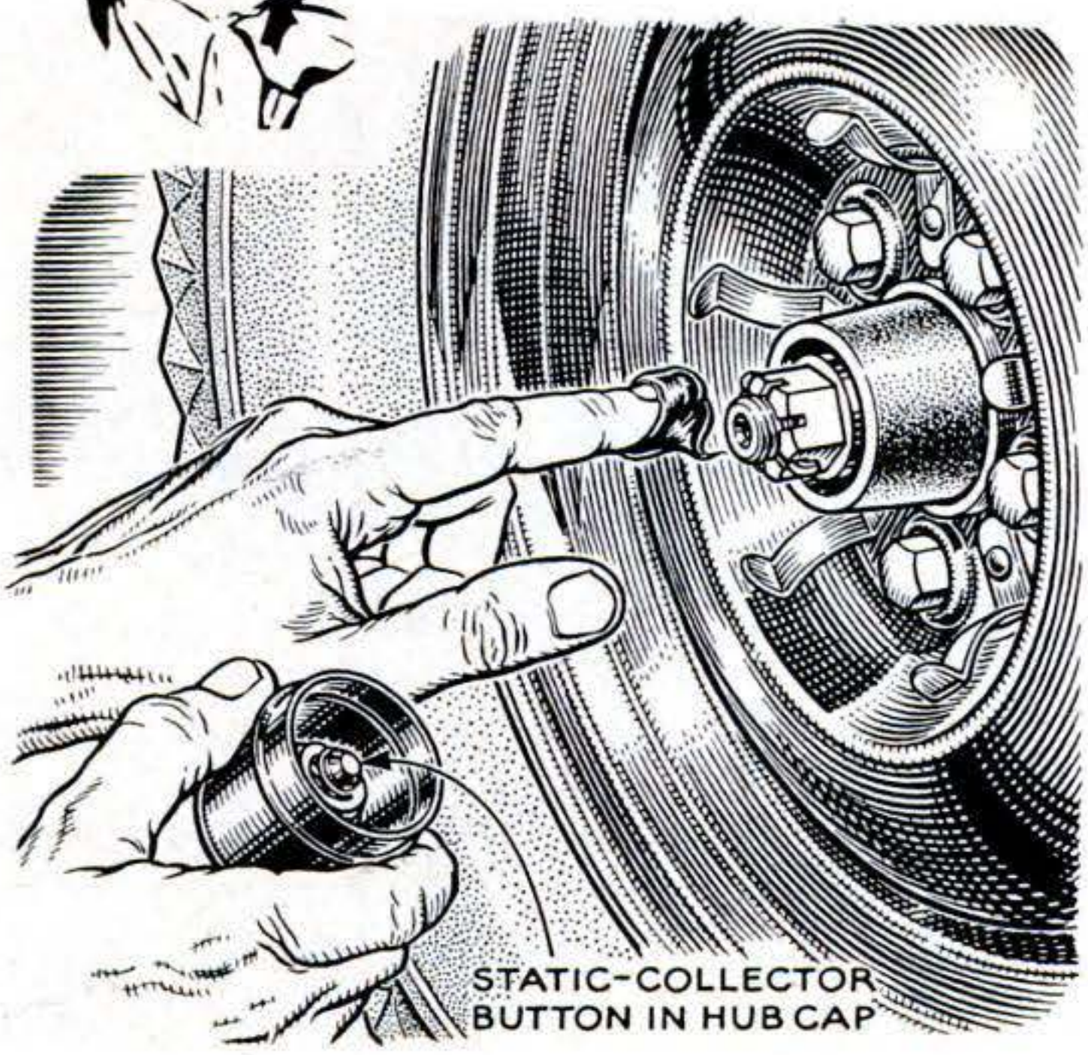
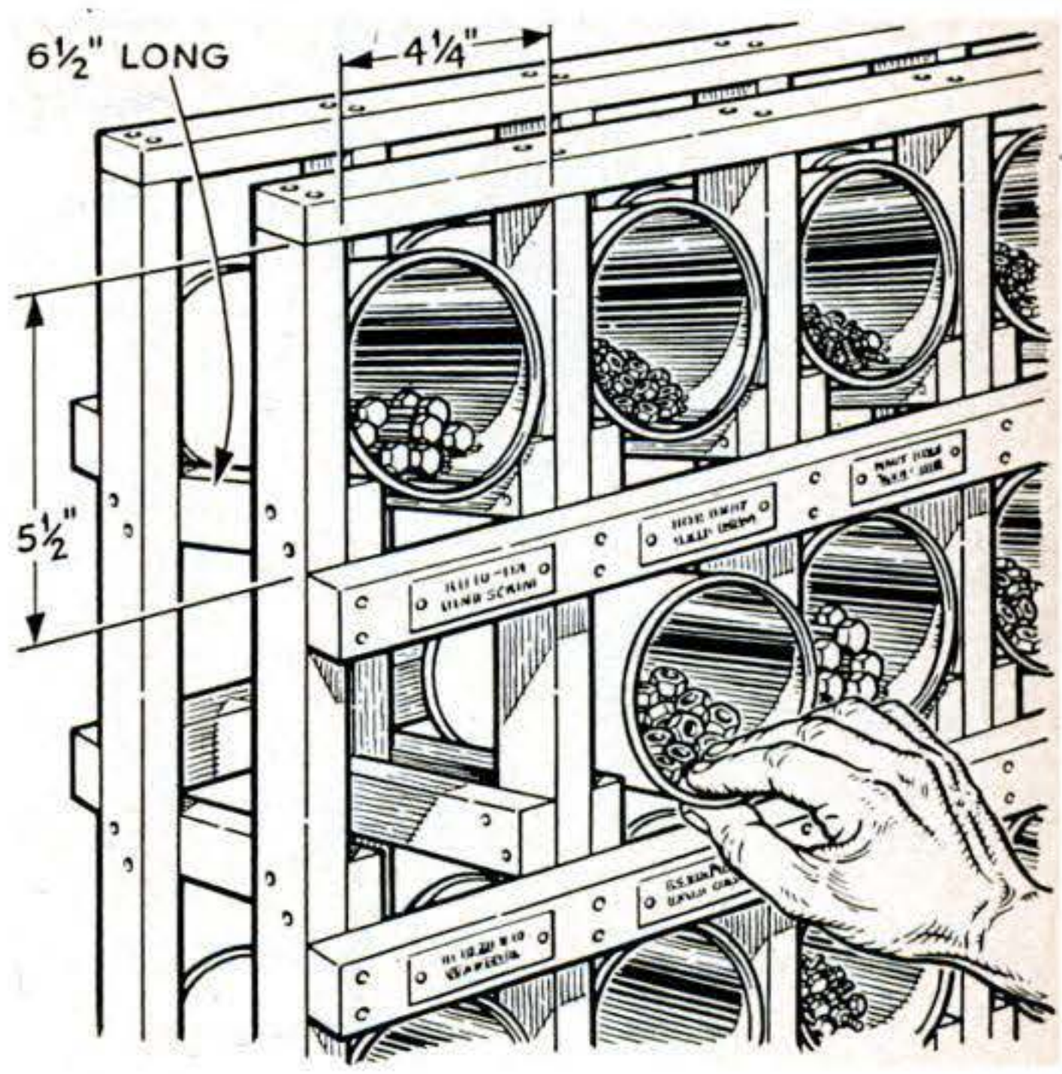
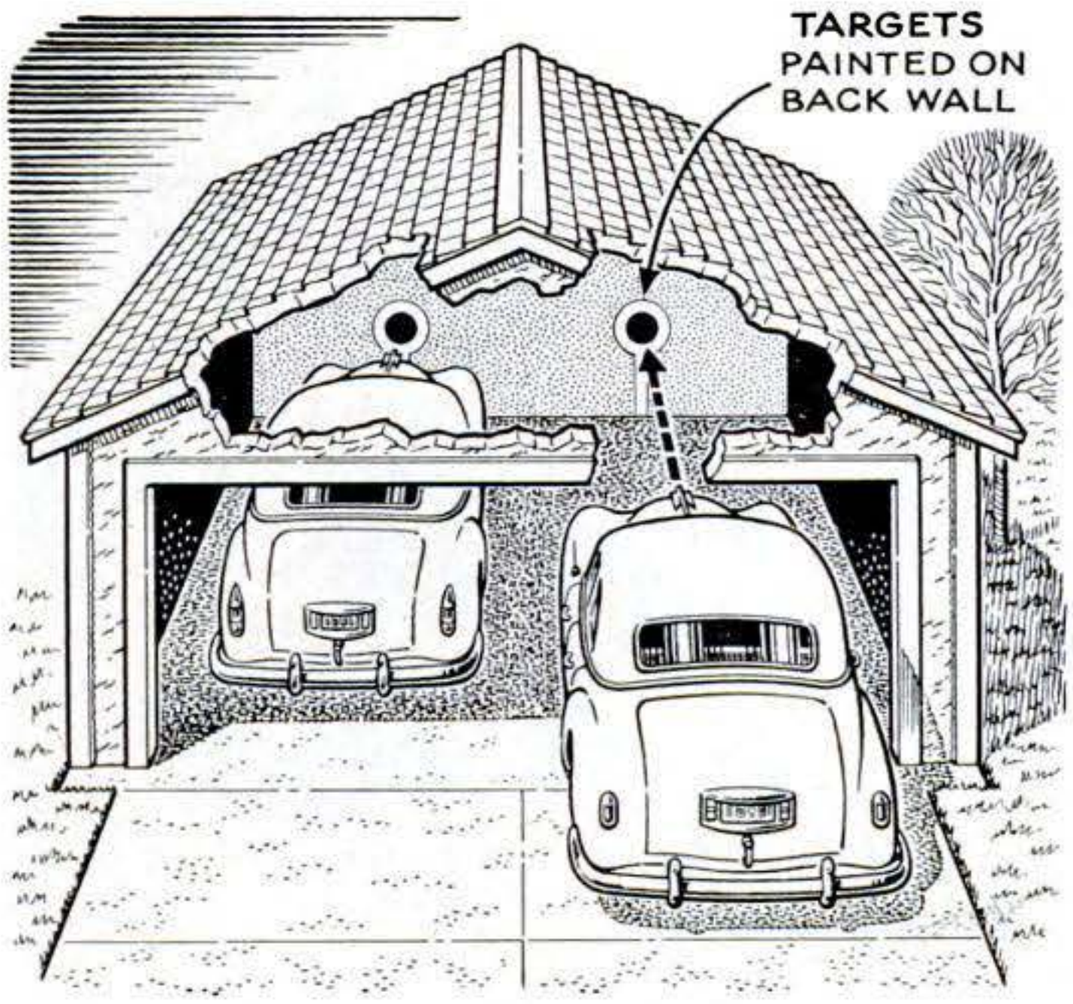
Hints from the Model Garage



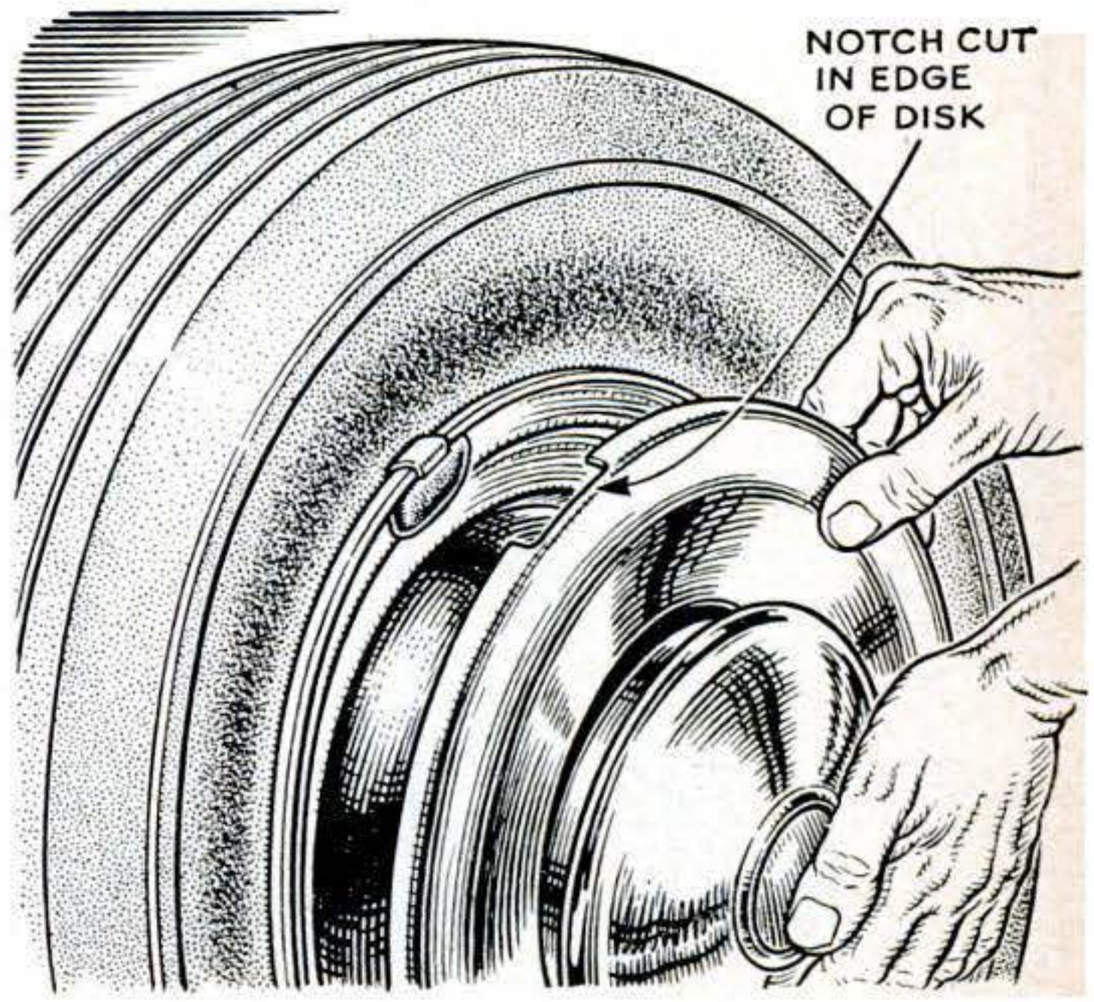
Lubricating Static Springs. When wheel springs are used to prevent static interference with radio operation, apply heavy graphite grease occasionally to the axle end. To make conductive grease, mix powdered graphite with petroleum jelly.



Small Parts Stored in Oil Cans. A rack for nuts, bolts and other small parts can be assembled from empty quart oil cans and cheap lumber. Build it so cans slope toward the back. The containers can be lifted out and carried to the job.



Targets Help Space Cars. While A. Zanelli, of Wyckoff, N. J., was renting a two-car garage to a couple of neighbors, one of them occasionally took too much room, blocking out the other. As a solution—and reminder—Zanelli painted a couple of alignment targets on the garage wall.



Fitting Disks Over Wheel Weights. In many cases, a garage man will tell you: "Use either wheel disks or balance weights —but not both." But you can make the disks fit over the chunks of lead by hacksawing out small slots. The light disks will not ordinarily disturb wheel balance.

Please turn the page for four more hints.

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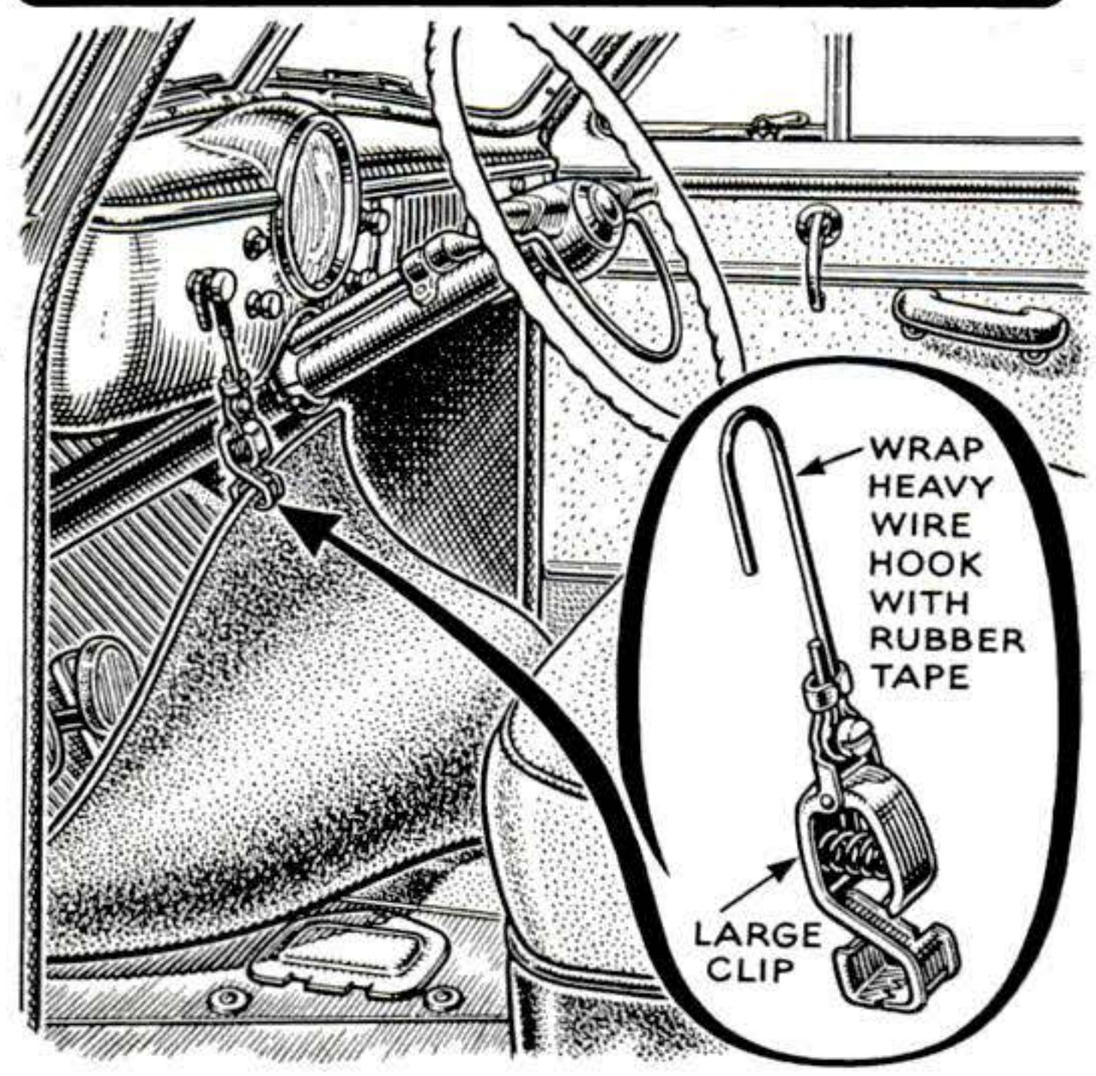
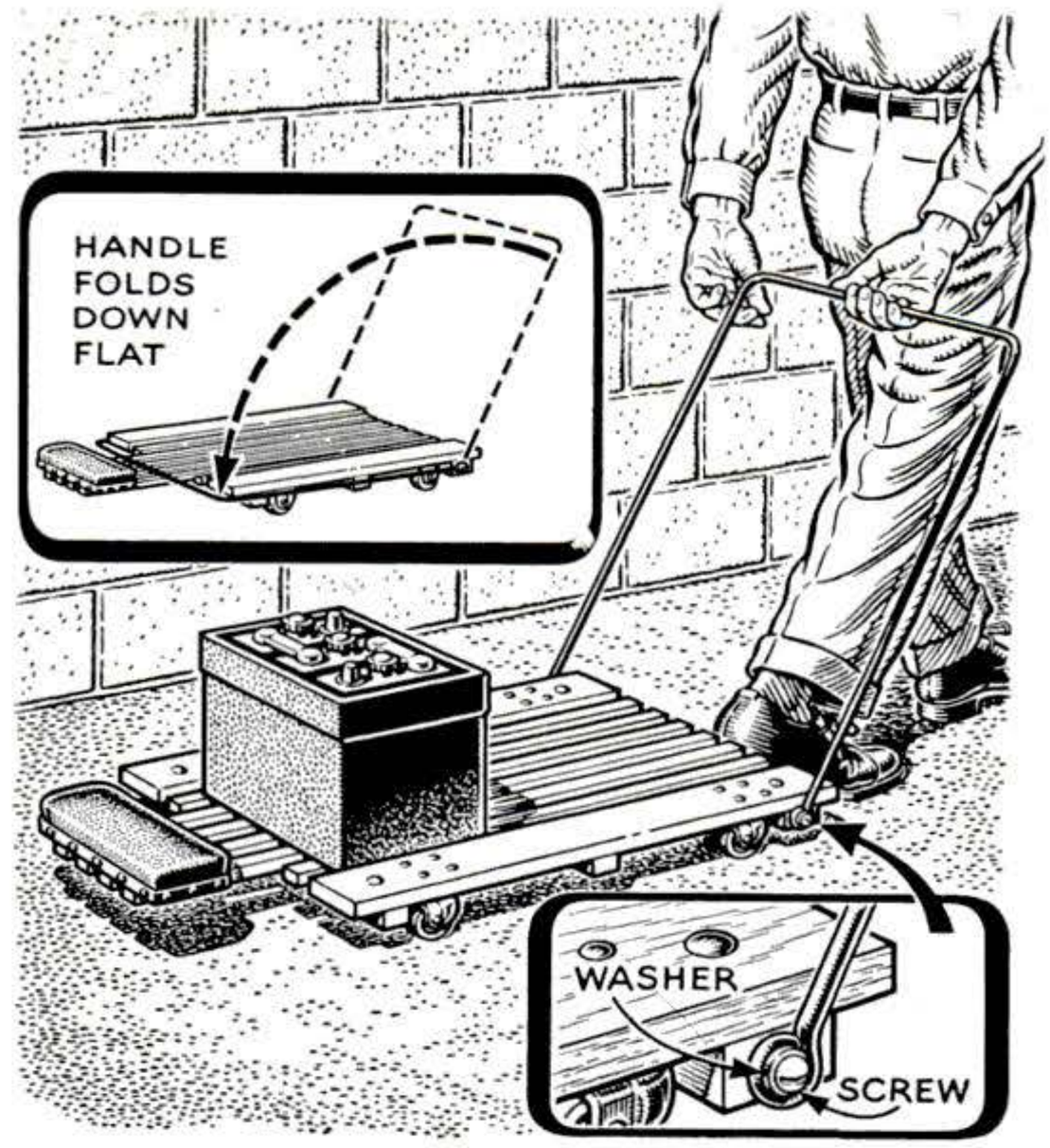
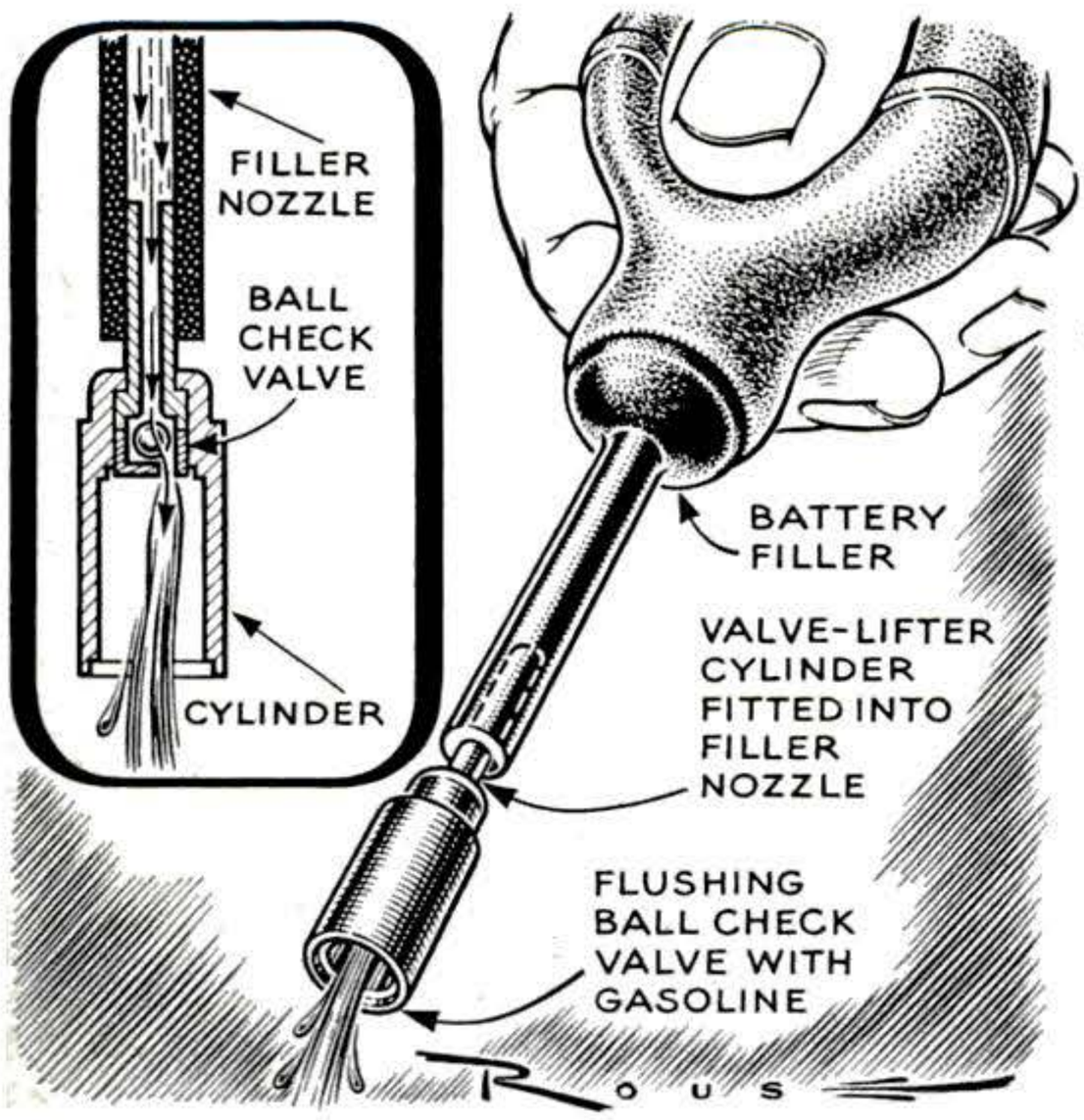
MORE Hints from the Model Garage



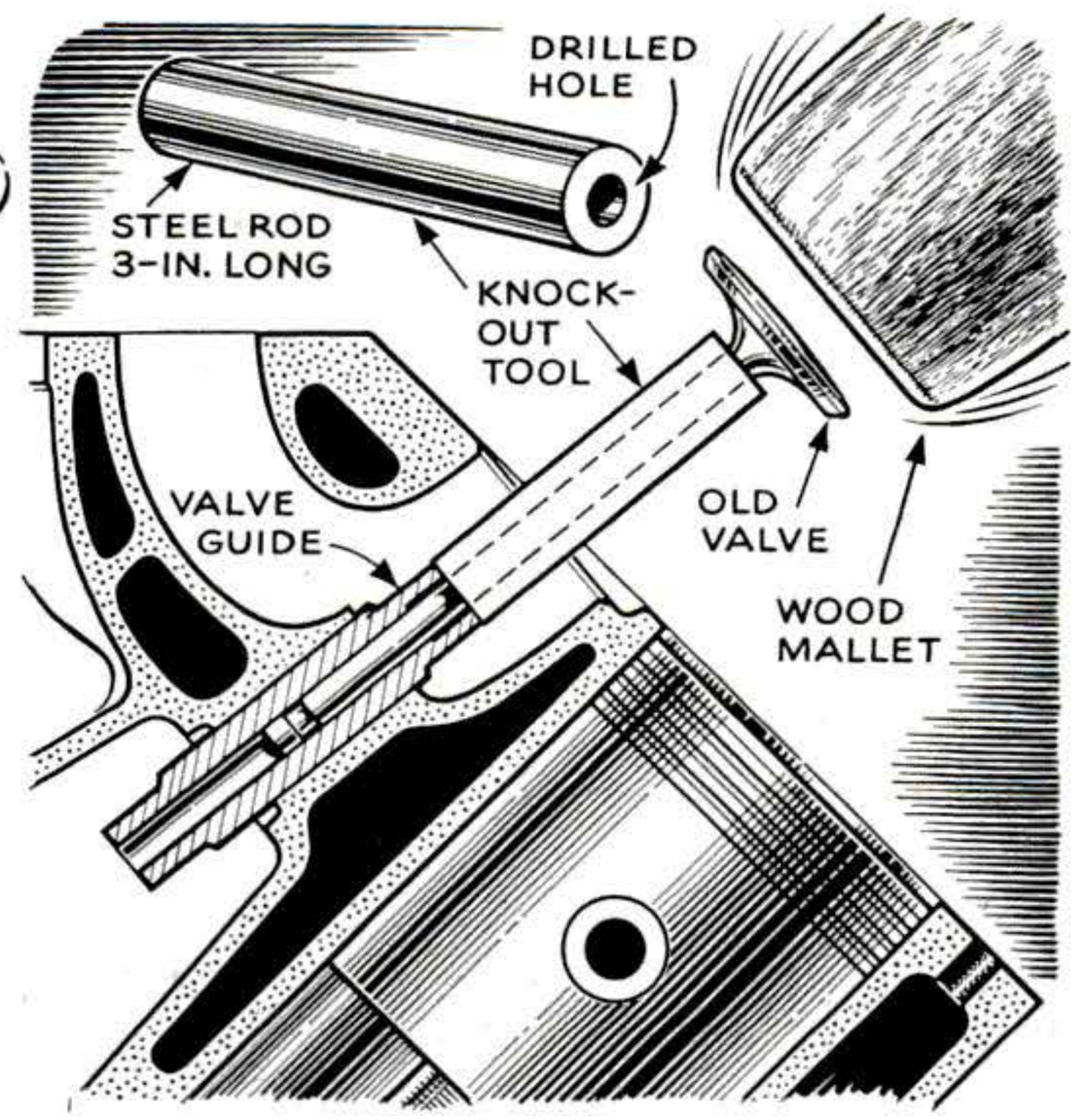
Mat Clip Leaves Your Hands Free. A clip like this will keep the mat out of the way when you're working on a master brake cylinder or battery under the floor. Hook it over one of the dashboard control knobs. A spring-closed battery clip does fine.



Creeper Hauls Batteries. Instead of toting heavy storage batteries, one mechanic moves them on a creeper fitted with a handle of ¼" cold-rolled rod. Swung down, the handle doesn't interfere with normal use of the creeper.



Syringe Cleans Hydraulic Lifters. If you aren't satisfied with the usual method of soaking in gasoline to clean hydraulic valve lifters, try this: Draw clean solvent into a synthetic-rubber battery syringe, fit it to the lifter stem, and force fluid through. Shake the unit as a test; the ball should make a sharp click.



Tool Knocks Out Valve Guides. Worn valve guides can be removed and new ones installed in some engines by using an old valve and a piece of cold-rolled steel. The outside dimension of the knock-out tool should be slightly less than that of the valve guide, the inside drilled to the same dimension as the valve stem. Use as shown.

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MEET MR. RAT. He has plagued man since prehistoric times. 15¾" long when grown, with 7½" tail, he weighs up to 12 ounces. He invaded America from both coasts before the Revolution.

New Poison Fools Rats

Warfarin is tasteless and painless, so a rat's cunning cannot save him from this new chemical exterminator.

By Gardner Soule

THERE are more rats than people in this country now—the experts say—but the rats are being liquidated rapidly in many areas by a new poison called warfarin.

A tasteless, odorless powder, warfarin has been in use for 18 months. In this brief period, it is credited with killing 20,000,000 rats.

Here are a few of the victories scored by this new chemical exterminator:

- In New Jersey, a man bought an old farmhouse. Rats had moved in first. He used warfarin.

"The first bait was entirely eaten, one pound; the second, ditto; the third, 50 percent, all these at 24-hour intervals. The fourth was apparently not touched. I have lived here for months since and have not

Cleanliness Is Important

SANITATION is the first step against rats. In Baltimore, a simple clean-up of city blocks reduced the rat population by two-thirds—it eliminated food and shelter for rats and forced them to move on, to fight and kill each other, or to die in their burrows. Around a home, sanitation means a garbage can with a tight cover, no clutter in attic or basement, and such things as:

KEEPING bird food on raised platforms and off the ground.

RIPPING out dark, enclosed places under floors or stairs where rats may live.

RAISING lumber, pipes, other stored material 24" off ground.

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HE FIGHTS The Norway rat has almost exterminated the smaller black rat; he fights other Norway rats over food supplies (above); he eats his relatives; he also fights for no apparent reason. He thrives where garbage cans are left open.

HE EATS corn in the crib, in the fields, in the mill. He eats fruits, potatoes, vegetables; chicks, eggs; bulbs, leaves, stems of flowers. He picks a well balanced, vitamin-rich diet. U. S. rats each year destroy as much food as 10,000,000 people eat.

seen a sign of or heard a rat," he reports.

- In Ohio, warfarin was tried in several locations, apparently eliminated all rats, and was left out in bait stations. "The value of this procedure," the Ohioans say, "has been evidenced in several cases where the premises *are still free of rodents several months later.*"
- In the South a dairy, plagued by rats for years, used warfarin. In a few weeks, 8,000 rats were wiped out. Now the dairy has no rats and only a few rat visitors, which warfarin kills.

The Farmer's Friend

Throughout the U. S., especially on farms (where the rat population is heaviest), men who have seen rats or signs of them are putting out warfarin-poisoned bait. Warfarin used as a dry bait does not freeze; it can be used all winter long, when the farmer, with his crops in, has time for a major drive against rats.

You can buy warfarin in two forms: Ready-mixed bait (0.025 percent warfarin), and warfarin concentrate (0.5 percent) to be mixed in foodstuffs for bait. The ready-mix costs from $1 to about $1.60 a pound. One pound is enough for a lightly infested home (about four rats); five pounds is enough, as a rule, for a lightly infested farm (20 rats).

Warfarin concentrate is mixed with 19 parts of a food—yellow corn meal, freshly ground yellow corn, rolled oats, nut crumbs, laying mash—to make bait. Dry cereals are mostly used because they are readily eaten by rats, because they are not readily eaten by pets and children, and because they remain palatable—if kept dry—for some time. The bait is put out in bait stations to keep it dry, and to keep children and domestic

1. Place cereal bait in can or drum. Empty warfarin concentrate (one part to 19 of cereal) into drum or can, on top of bait material. Replace cover of the drum.

2. Shake can thoroughly, or roll it along table. Open, remove sample on mixing paddle. Smooth on paddle. If streaks of color show, shake the can again.

3. Mixing is complete when there are no streaks left. Put bait almost up to the tops of empty, dry coffee tins, crocks, fruit-jar tops or pie tins.

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HE GETS IN He can wriggle into a home through an opening less than an inch in diameter. A basement drain is a highway for him if it is left open or only partially covered (above). He can also sneak in through broken window panes.

HE GNAWS Rats have four chisel-edged incisor teeth (two up, two down) that grow all during his life. He must gnaw to keep them worn down. He gnaws door edges, makes an entrance. He gnaws wiring, lead pipes, oak, even concrete.

Photos from U. S. Fish and Wildlife Service

animals from spilling it and from eating it.

Warfarin is poisonous to all warm-blooded animals if taken in large enough doses on successive days. Some animals have been killed by it, but advocates of its use say no human deaths from it have been reported. Since it is new, common-sense precautions should be taken.

It's for Rats Only

The poison should be placed where only rats can get it. Hogs may be poisoned by it. And a cat or dog that eats warfarin-killed rats for four or five consecutive days is likely to die from the stomach contents of the rats. It is best to bury the dead rats.

Rats often pass up warfarin bait the first night, and persons who expect immediate results are disappointed. A rat is suspicious of anything new, and will usually shy away from a bait station for a night or two, until

HE CAN BE STOPPED as by a screen. Then he may have to migrate. Otherwise he lives all his life (1 to 2½ years) within about 100 feet of his burrow, which is located in ground, refuse heap, stored goods, walls.

4. Use clean equipment for mixing and for holding bait in traps. Never mix warfarin with other poison. Bait containers must be 3½" or less in height.

5. Use bait boxes or stations to keep bait from children, cats, dogs, livestock, and to keep bait dry and uncontaminated. Build the stations from waste lumber.

6. Simplest bait station of all is piece of lumber 5′ by 8″. It is nailed against wall—rats hug the walls for protection. Put some water nearby. Water helps attract rats.

7. Sift white flour on the floor or on ground around the bait stations. Watch for tracks. If there are none within three nights, move the bait station.

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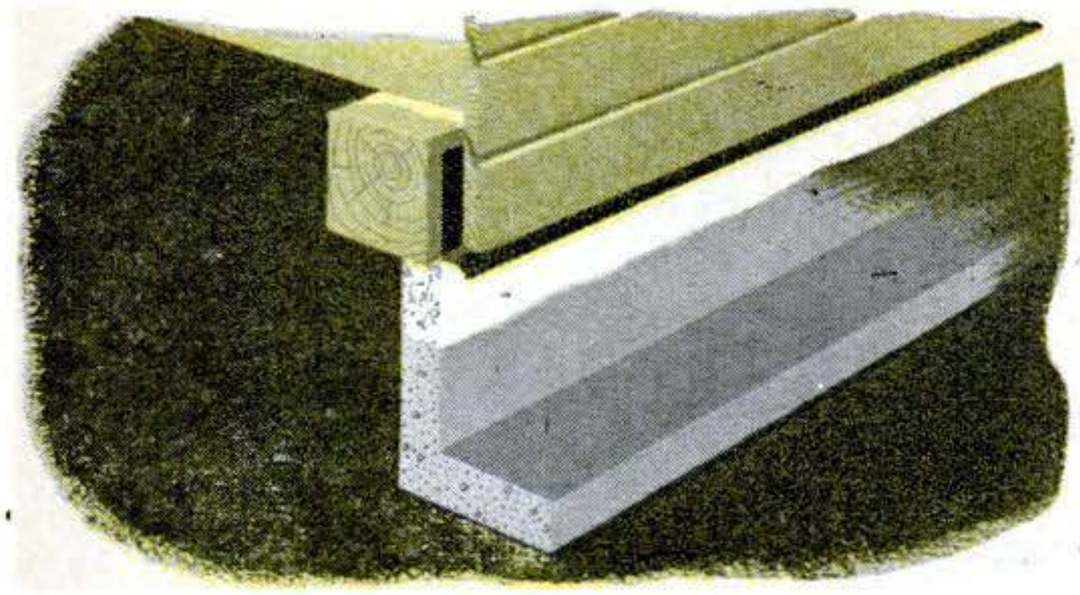
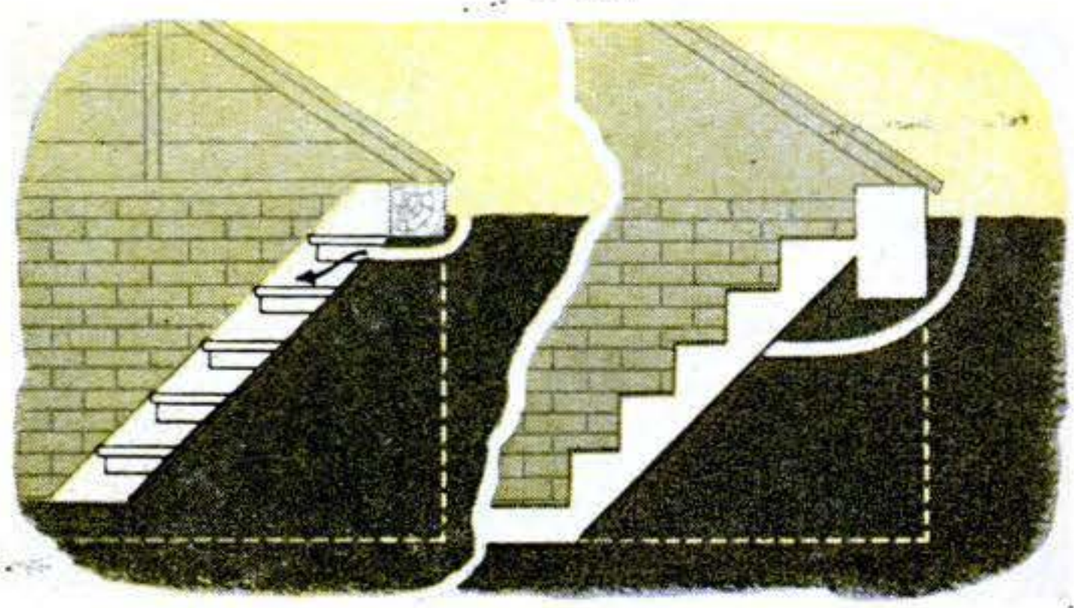
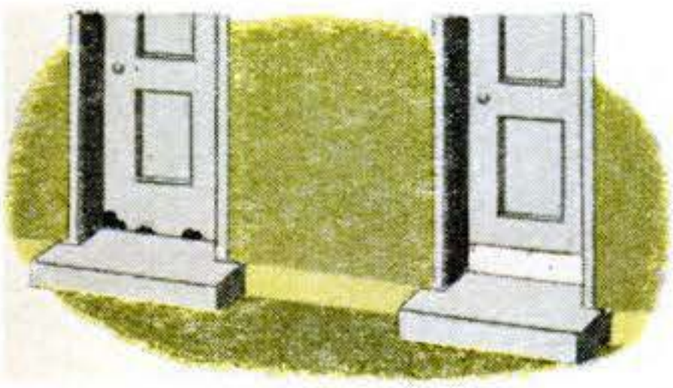
BUILD 'EM OUT That's the exterminator's term for ratproofing your home or any other building. When you build them out by using concrete and metal, rats have no way of getting in to food—a sure way to cause them to migrate. But to be sure of complete freedom from rats, you should follow all these rules: keep your premises sanitary; ratproof your buildings; *and* use traps and poison to kill rats already there.



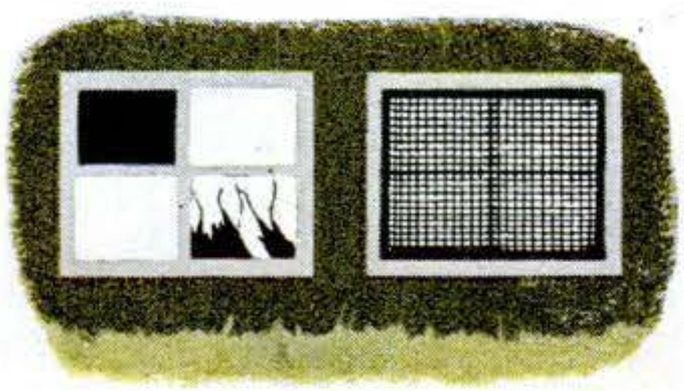
Install concrete curtain wall to prevent rats from burrowing under building. Curtain wall does not support building.



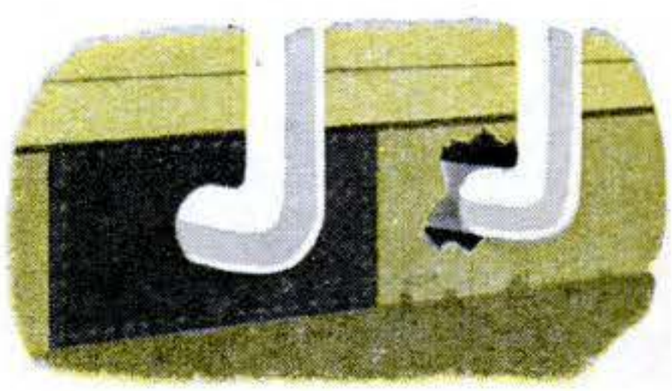
Seal cellarway with concrete to block out rat burrow and to make the stairway completely ratproof.



Put metal flashing on gnawed or rotted doors. A rat can go through space ½" square.



Screen basement windows—all of them. Replace any broken window panes.



Close foundation openings ½" or larger with metal collars, shields or masonry.

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he has inspected it closely from all angles.

One dose of warfarin does not kill a rat. But he returns to eat again and again, and when he has consumed 36 percent of his body weight of the warfarin-dosed bait, the condemned rodent has had his last meal. Since a rat eats 10 percent or more of his weight each night, and probably takes other food besides the bait, it usually takes four or more nights' feedings to kill him.

Nothing drastic happens to the rat the first two days. On the third or fourth day, he starts to bleed internally and this continues until he bleeds to death. His capillaries (the smallest blood vessels) are broken down. Then warfarin prevents his blood from clotting. This is internal; often a dying rat shows no blood outside his body. Because his blood system has no sensory nerves, he dies without pain.

Warfarin is effective because the rats don't know what's happening to them. This may be because it is odorless and tasteless. It may be because there are no external symptoms, like bleeding or spasms. It may be because there is no pain. So the rat, who is dying from a hemorrhage around the heart, from suffocation due to lung hemorrhage or from exhaustion due to lack of blood to carry food to tissues, continues to eat the bait—even when he has to drag himself slowly to it—until the end.

Other Poisons Kill Quicker

Where quick kills are wanted, other poisons are likely to be more effective. They are often used, in fact, to thin out the rat population before warfarin is set to work. They should not be mixed with warfarin; if they are, the rats may quickly learn what is killing them and avoid the bait.

Antu is an effective poison on initial use (PS, April '47, p. 91). It is poisonous to hogs and dogs; not very harmful to men and poultry.

Red Squill comes as a liquid (warfarin does not) as well as in powder form. It does not harm domestic animals. *Red Squill* makes a domestic animal (or a man) vomit. The rat cannot vomit.

1080, the most powerful rat poison, does the best job of getting rid of rats in a single night. But it is so deadly to men as well as

[*Continued on page 246*]

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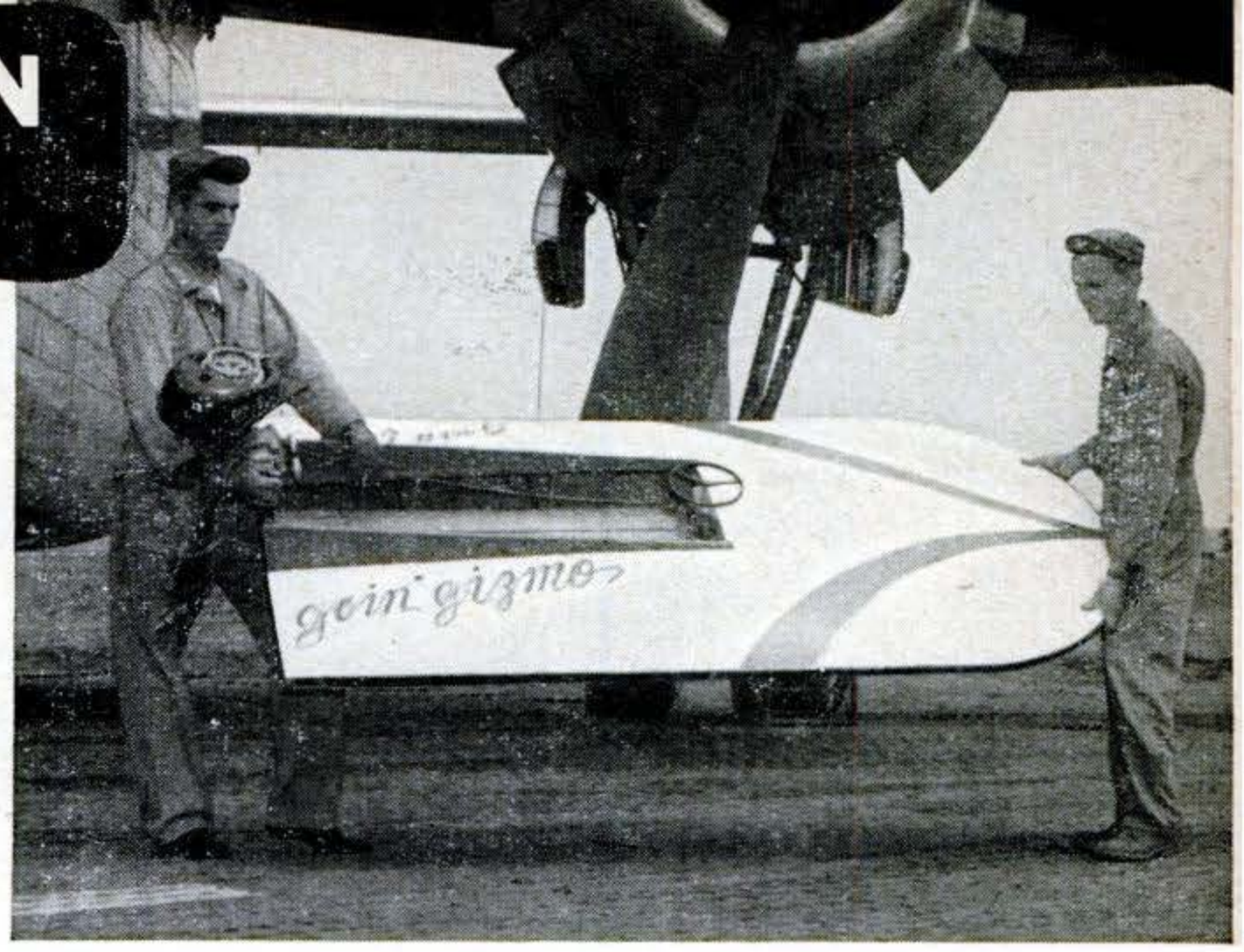
CRAFTSMEN AT WORK



Boat Built from PS Plan. Two pilots on the Korean Airlift have been shooting around Japanese waters in a Flying Saucer—POPULAR SCIENCE style. The photo shows a racing hull built by Lt. W. E. Buckley, Murfreesboro, Tenn., and Lt. H. S. Britton, Dayton, Ohio, from plans published in PS last February.

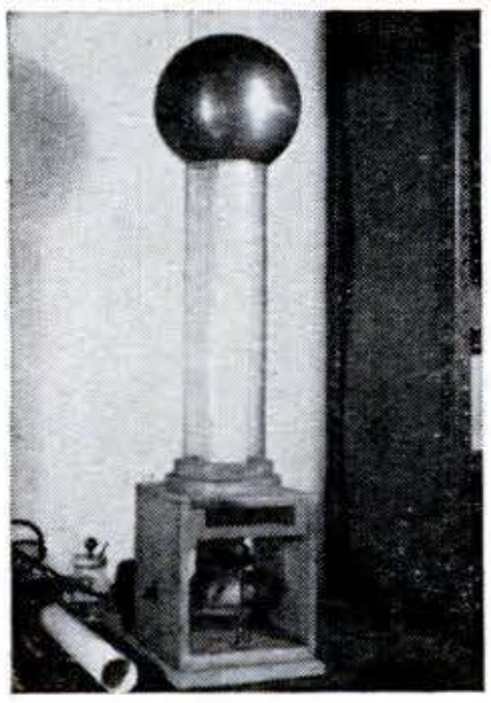
But instead of calling it the Flying Saucer, they have named their boat the Goin' Gizmo.

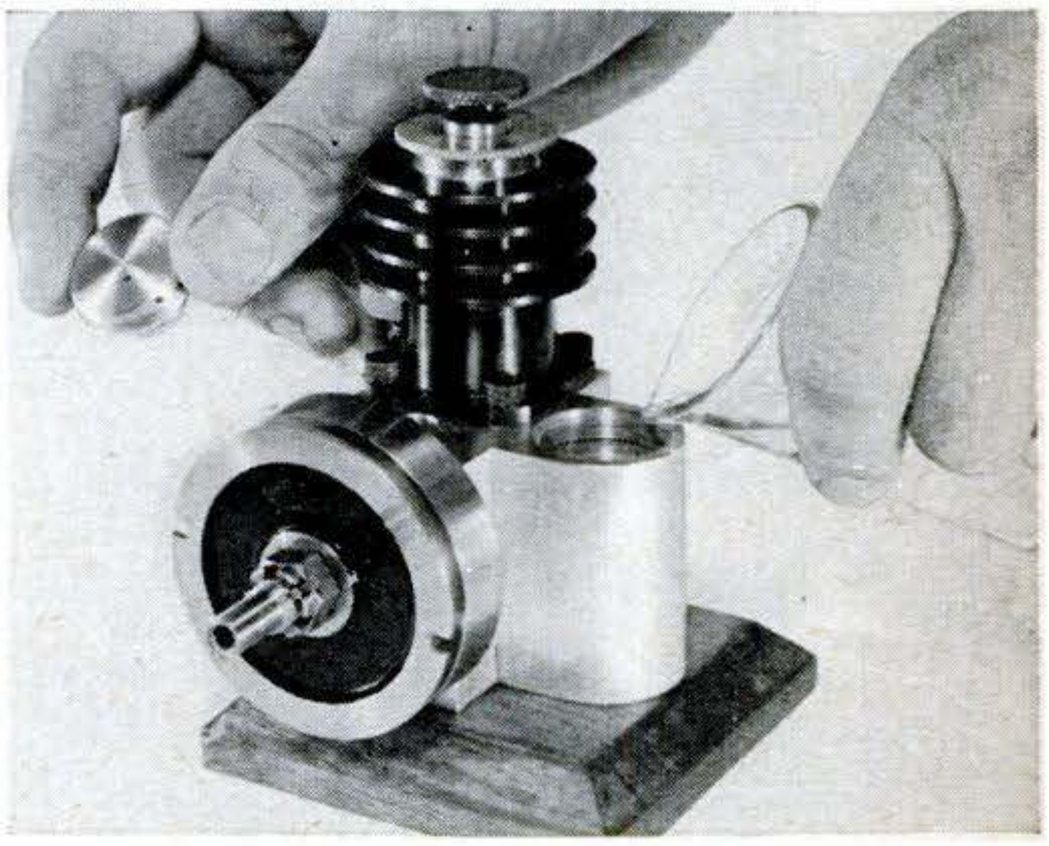
The project began when the pilots acquired a 4½-hp. outboard motor. Gestures and a mixture of English and Japanese got some Japanese boatbuilders started on the hull.

When the craft was finished, the pilots found the 4½-hp. motor didn't turn up enough speed, so they borrowed a 10-hp. job. Now they skip around at 40 m.p.h.

Secretary Builds Furniture. When Secretary of State Dean Acheson has a chance to get away from it all at his Maryland farm, he's likely to relax by making fine furniture. In his well equipped woodworking shop at the farm he has turned out many products, but this Pennsylvania Dutch china cabinet, shown here in the farmhouse dining room, is his most ambitious piece.

Static Generator Shoots Sparks. This model of a Van de Graaff electrostatic generator was built by C. C. Frankenfield, Newark, Del., from PS plans (Oct. '46, p. 188). A silk belt that runs up and down inside the column generates static electricity. Static sparks can be drawn from the copper ball. It makes an electric "breeze" strong enough to blow shredded paper.





Model Diesel. Lathe and drill press were put to good use by Weldon T. Golden, Jr., of Portsmouth, Va., in building this slick two-cycle engine. The cylinder dimensions are "square"—both bore and stroke are ¾". It has a rotary valve, adjustable compression, runs on home-concocted fuel, has been clocked at 7,000 r.p.m.

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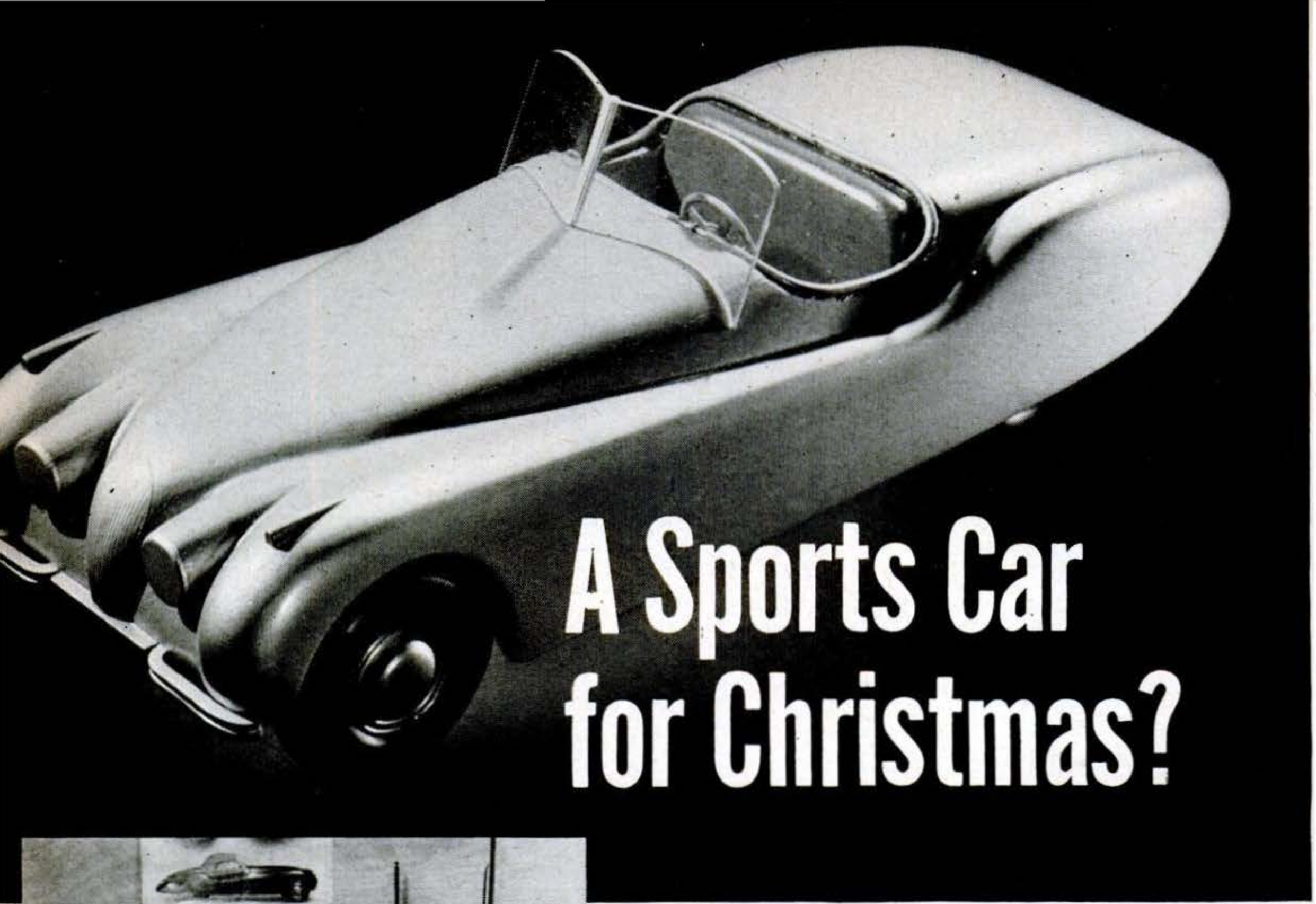
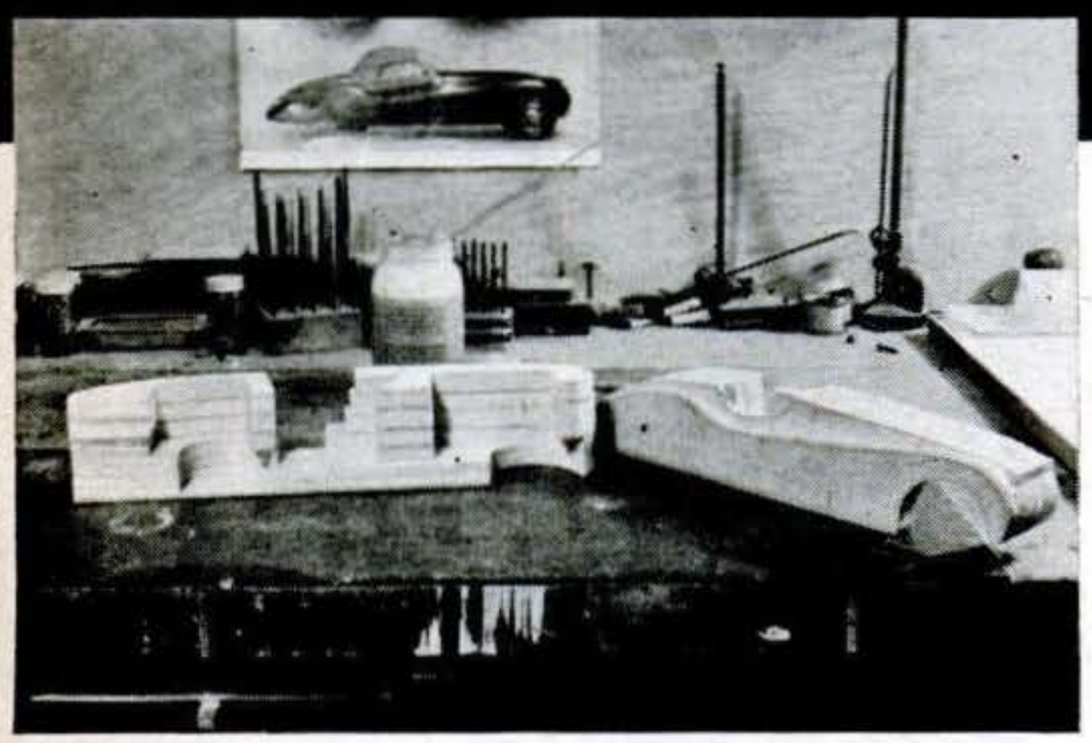


A Sports Car for Christmas?



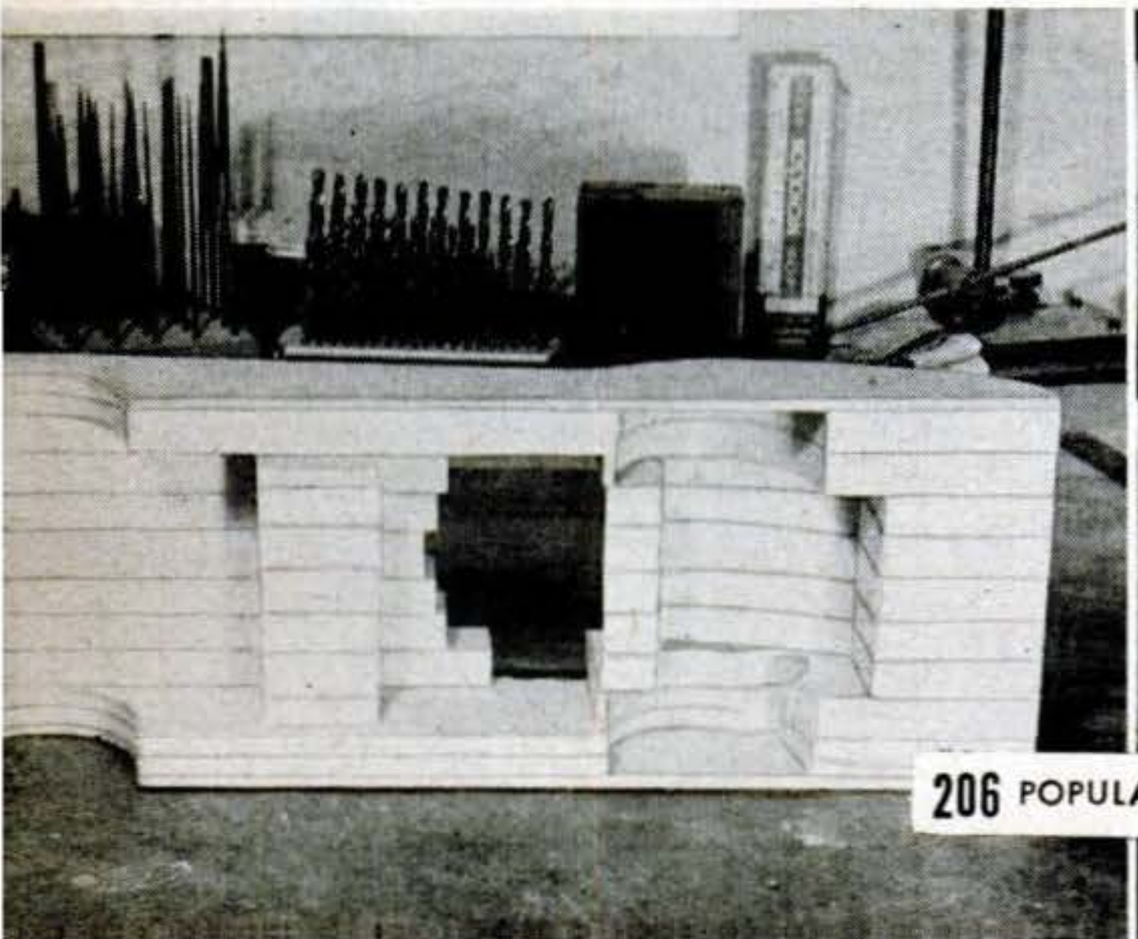
Jigsawed sections are glued together to form the body. Left and right sides are cut to identical patterns. By jigsawing and gluing flat pieces, you eliminate most of the carving.

Got a yen for a Jag? For pennies instead of pounds you can have a miniature of the British speedster.

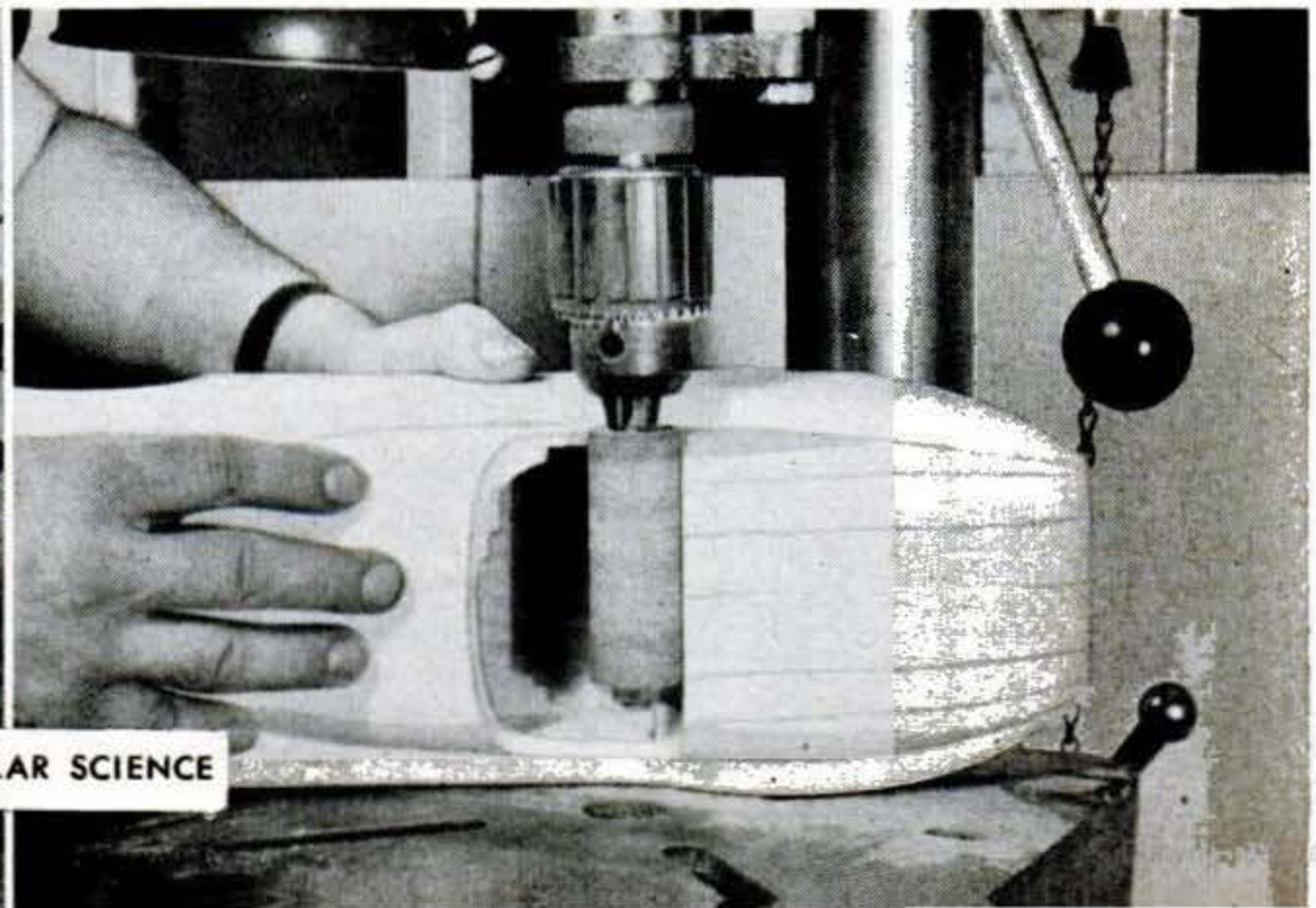
By Herbert Pfister

THE Jaguar XK 120—England's super sports car—comes as close to flying as anything that rides the ground. With twin overhead camshafts, it can top 125 m.p.h. or amble through traffic like a baby carriage; it can rocket from rest to 100 m.p.h. in less

The bottom must be accurately shaped to provide clearance for motor and wheels. Chassis board fits inside and is screwed to square projections in front and back of driver's seat.



A sanding drum in a drill press will do a quick, clean job around the driver's compartment. It is particularly good for shaping the gentle slope of the elbow rest.



than half a minute and it can brake to a fast skid-free, road-hugging stop. The Jag two-seater has set sports-car performance records, and yet it is famous for its smooth, comfortable ride.

It takes about $4,000 to buy this package of streamlined dynamite, but you don't need money or even a lot of modeling skill to enjoy a carbon copy. Pictured here is an accurate scale model that also has a simplified running gear that lets you see the Jag in action. It is easy to make this model because you do 90 percent of the carving with a saw.

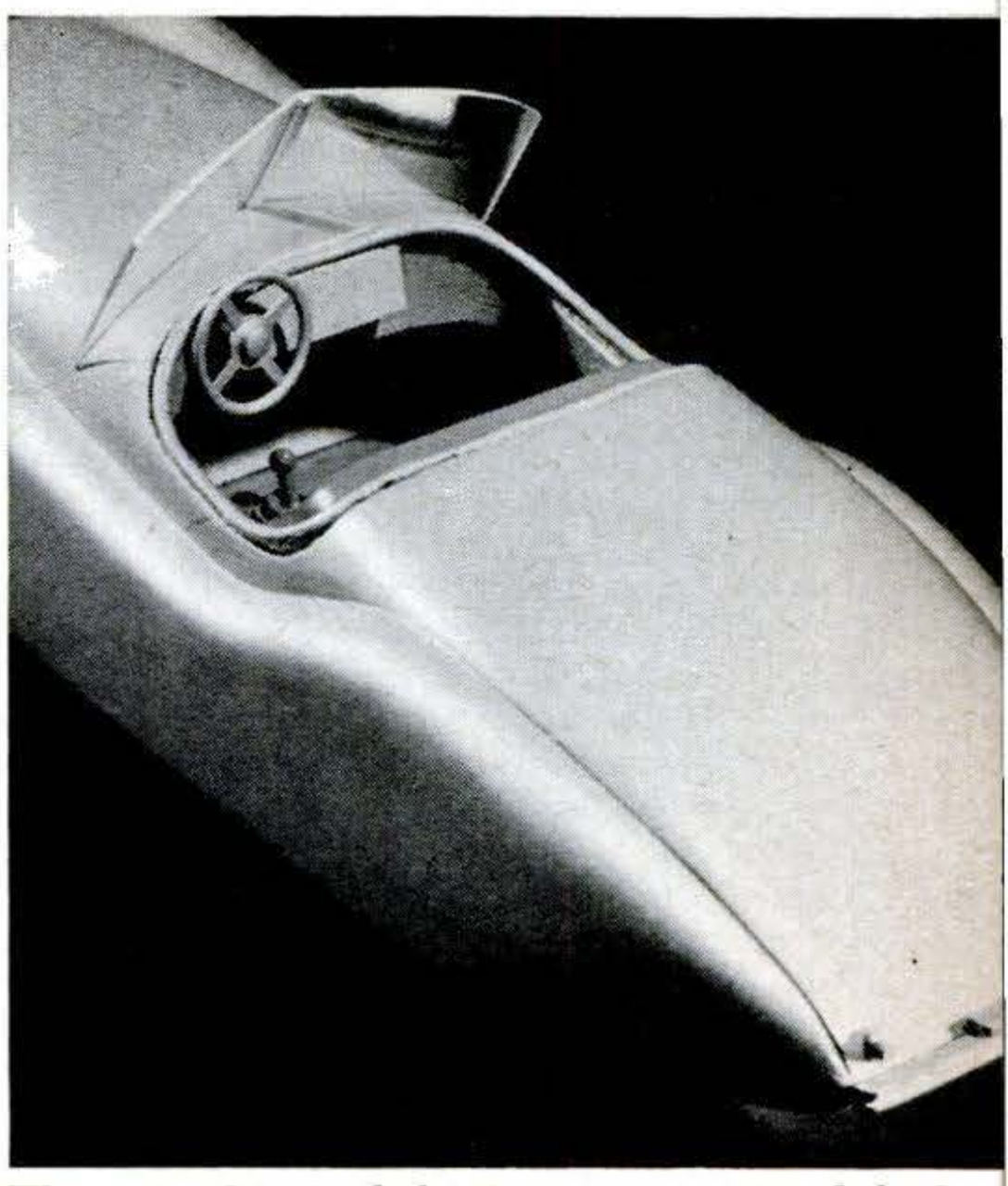
Steering Wheel Is Clock Gear

The drawings on the following pages show the steps by which you build up the body and chassis. For the details of trim and finish, you can improvise from parts on hand. The steering wheel is an example. Instead of shopping around for a ready-made wheel, I used a four-spoke clock gear. I dropped a blob of solder on the hub, chucked the wheel in an electric drill, and turned the solder against a file to form a round, smooth horn button. To complete the wheel I slit open a length of fine radio "spaghetti" and cemented it around the rim.

Rather than waste time turning the wheels, I picked up four model-plane wheels, complete with tires. For the front hub caps I used plated furniture glides—the kind with a center brad or tack. I cut the brads short and drove them into undersize holes drilled in the axle ends. The rear wheels do not need hub caps because they are covered by the fender skirts.

Before applying the finish I removed all the trim and separated the body from the chassis. I brushed on several coats of lacquer sealer to fill the grain and sanded between coats and after the last one until the shell had a glasslike surface.

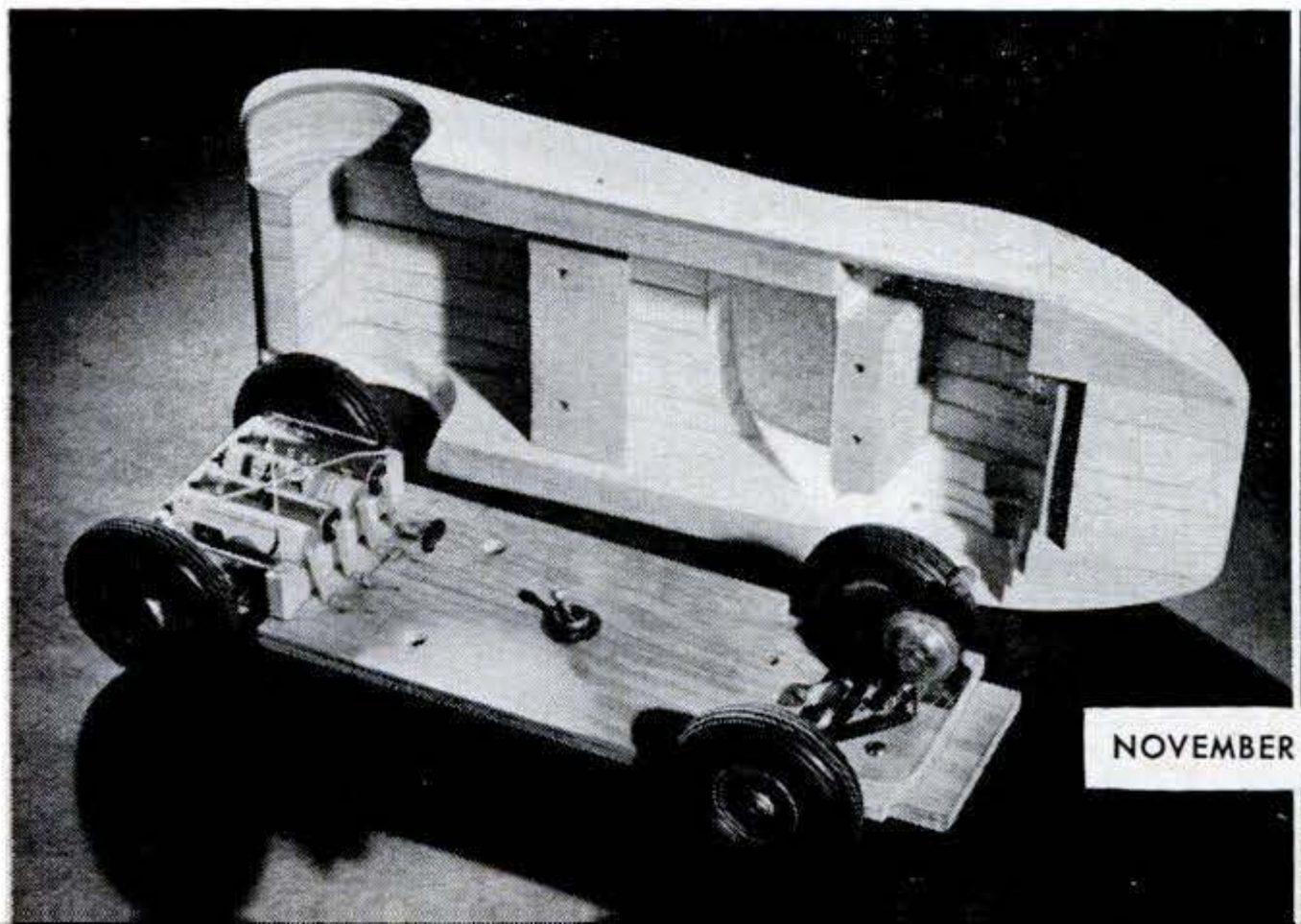
For the final coat I used regular model dope. I made the body color a metallic gray by mixing 95 percent silver with 5 percent deep blue. I used plain silver on the windshield edges, bumpers, headlight lenses and grille. I painted the seat and back rest dark gray and dabbed two little circles of red on the tail lights. Start now and you'll have the Jag under the tree Christmas morning.



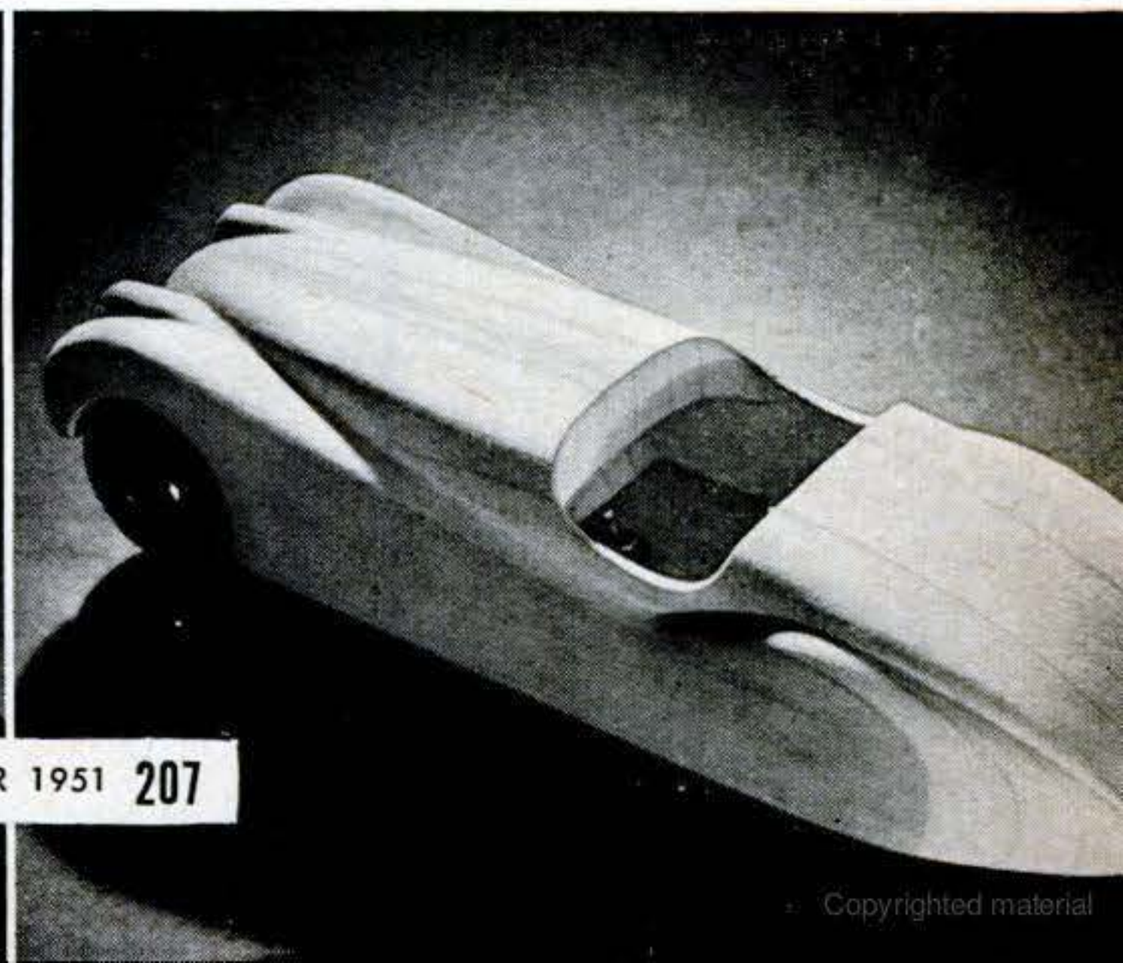
The trim lines of the Jaguar are copied faithfully in this model. And you need only "shift" the switch lever to see the Jag take off.

Please turn the page for working drawings of the Jaguar.

Electric power plant is simple and inexpensive but has a lot of pep. Toggle switch, front and center in the driver's compartment, takes the place of real car's gearshift lever.



Smooth flowing contours that have made the Jag famous show up on model as soon as it is assembled, even before finish is applied. Note four exposed layers of wood past rear wheel.



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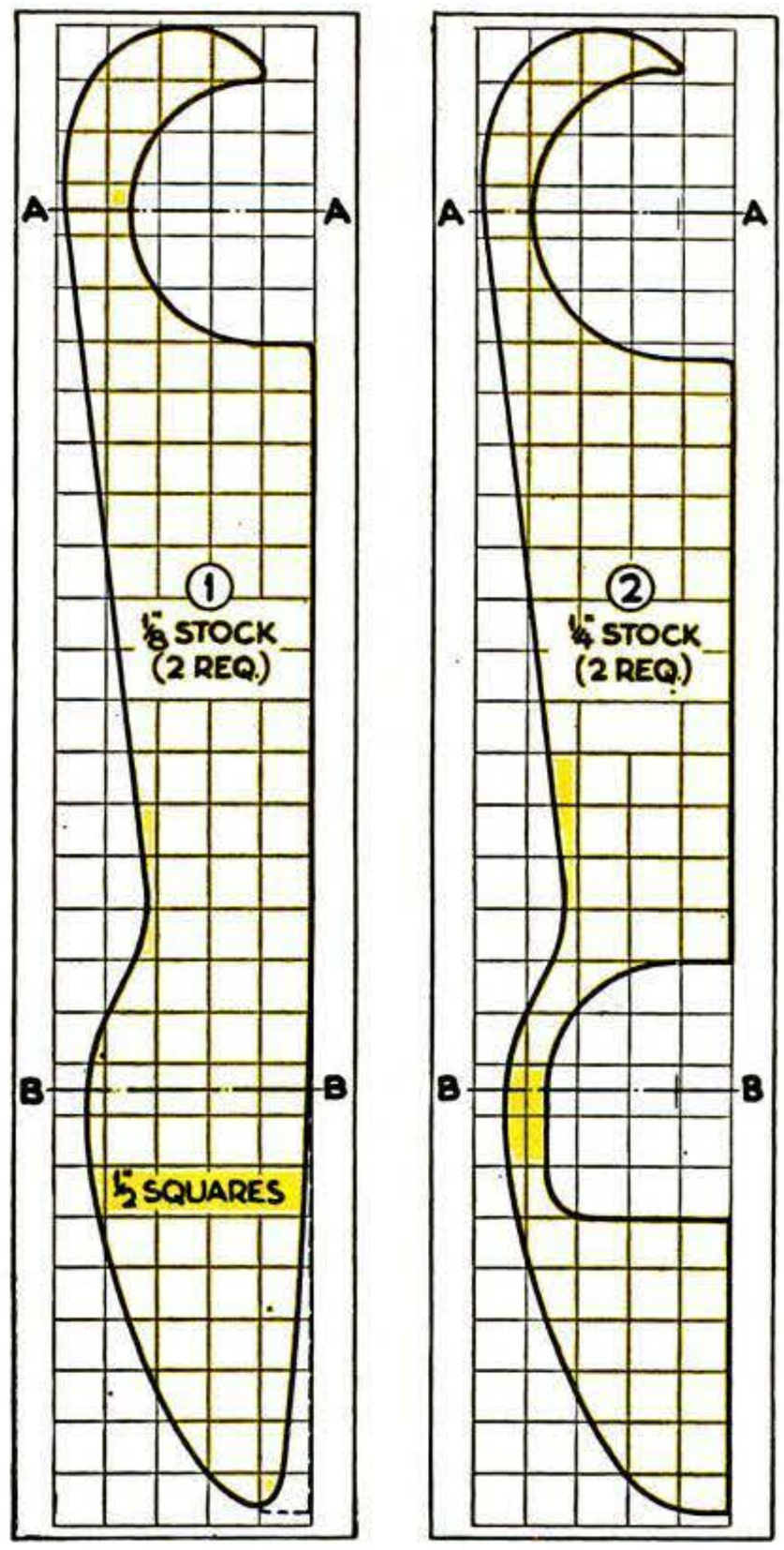
The body is made up of 13 sections jigsawed to the seven patterns shown at right. Using either clear pine or hard balsa, saw off 3" by 15" pieces of differing thicknesses: make two pieces ⅛" thick, six ¼", and four ½". You will need a thirteenth piece for the center (section 7) but don't saw it off just yet.

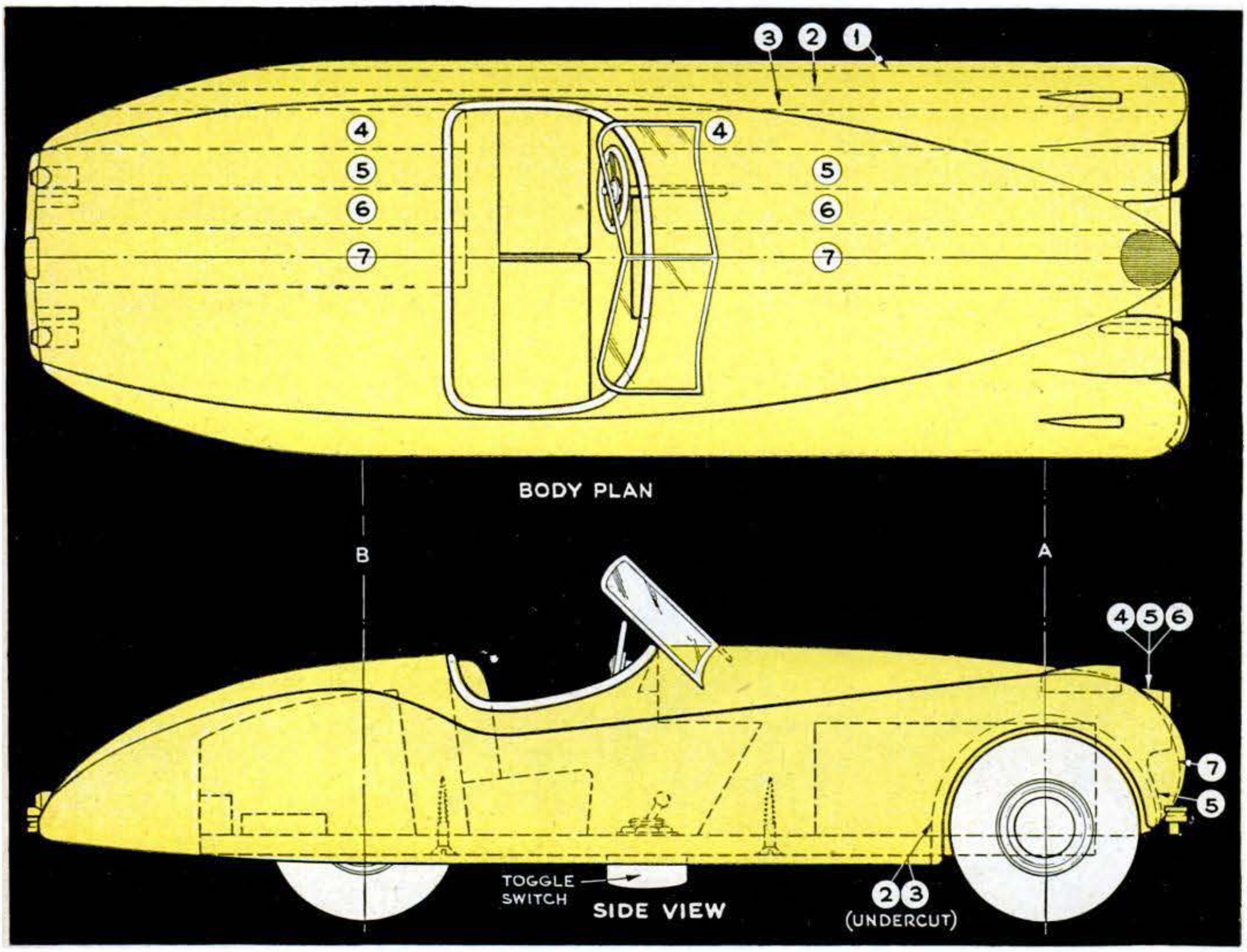
Enlarge the outlines, trace them off onto pieces of suitable thickness, and saw the individual sections. Make two each of sections 1 to 6 and glue up separate sets, joined in numerical order. Measure the combined width of both sets and cut a piece for section 7 to whatever thickness you need to bring the finished width of the body to 4½". The glued-up sections have most of the body shape built in. Finish the little that remains to be done with sharp chisels and sandpaper. To get the headlamps truly round, screw ¾" faucet washers over the fronts and use them as guides while rounding the shells. Glue bits of pine to the fenders and carve them to simulate parking lights.

Clear plastic is excellent for the bumpers, tail lights and windshield because you can carve, cut and bend it. The two front bumpers are ¼" strips bent and grooved as shown and pressed into holes in the body. Two studs cemented to the rear bumper hold it in similar fashion. Mounting holes for the bumpers can be punched or drilled in balsa but the ones that take the tail lights (short lengths of ¼" rod) must be round. Make these by pressing ¼" metal tubing into the soft wood.

The V-shaped windshield is 1/16" plastic heated in the center and bent over a wood block. A strip 1/16" square cemented along the V line projects 1" at the bottom and pins the windshield to a hole in the hood.

The seat, a block of balsa glued to the floor board, is divided in two by shallow file grooves on top and front. The back rest is a similar block glued to the body.





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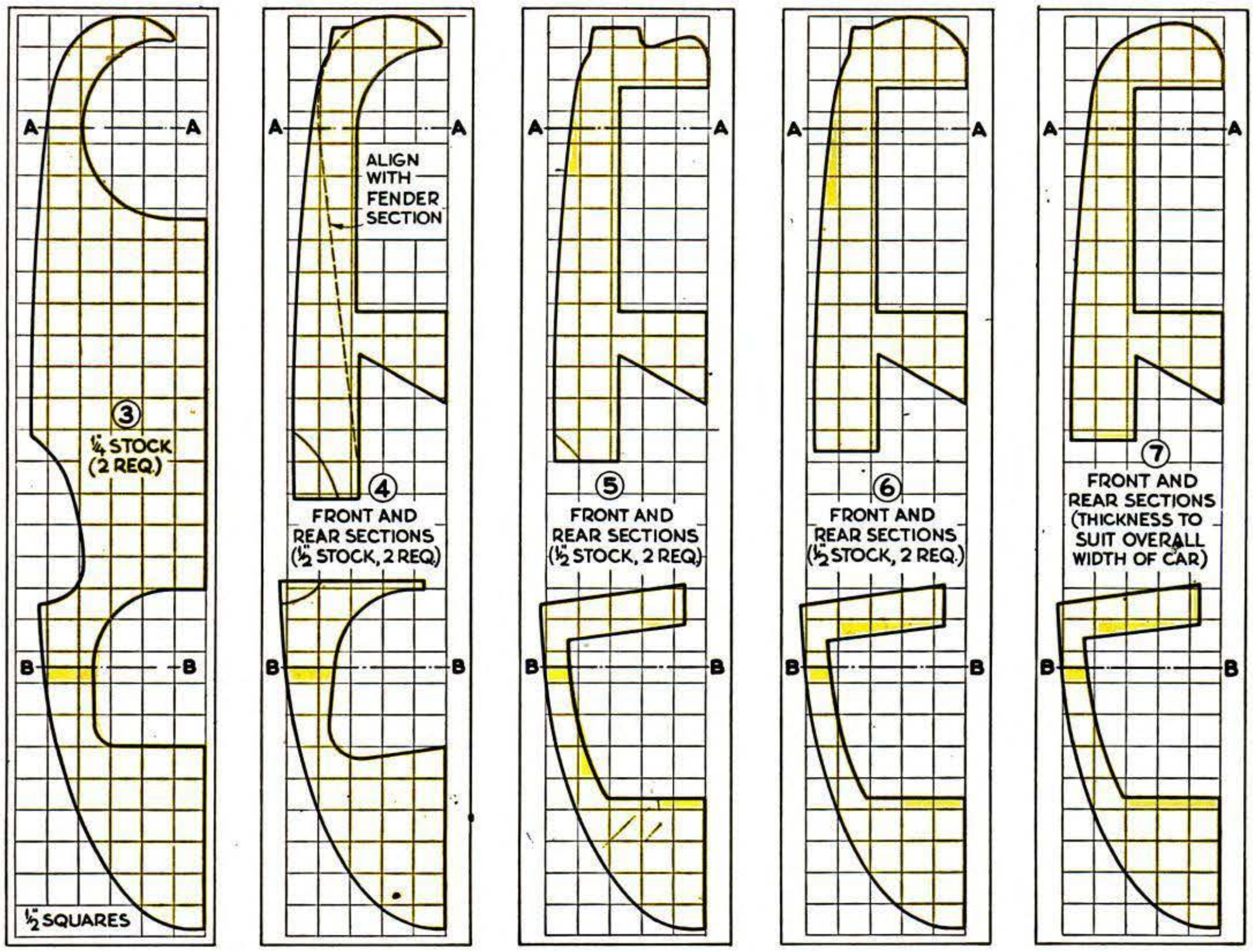
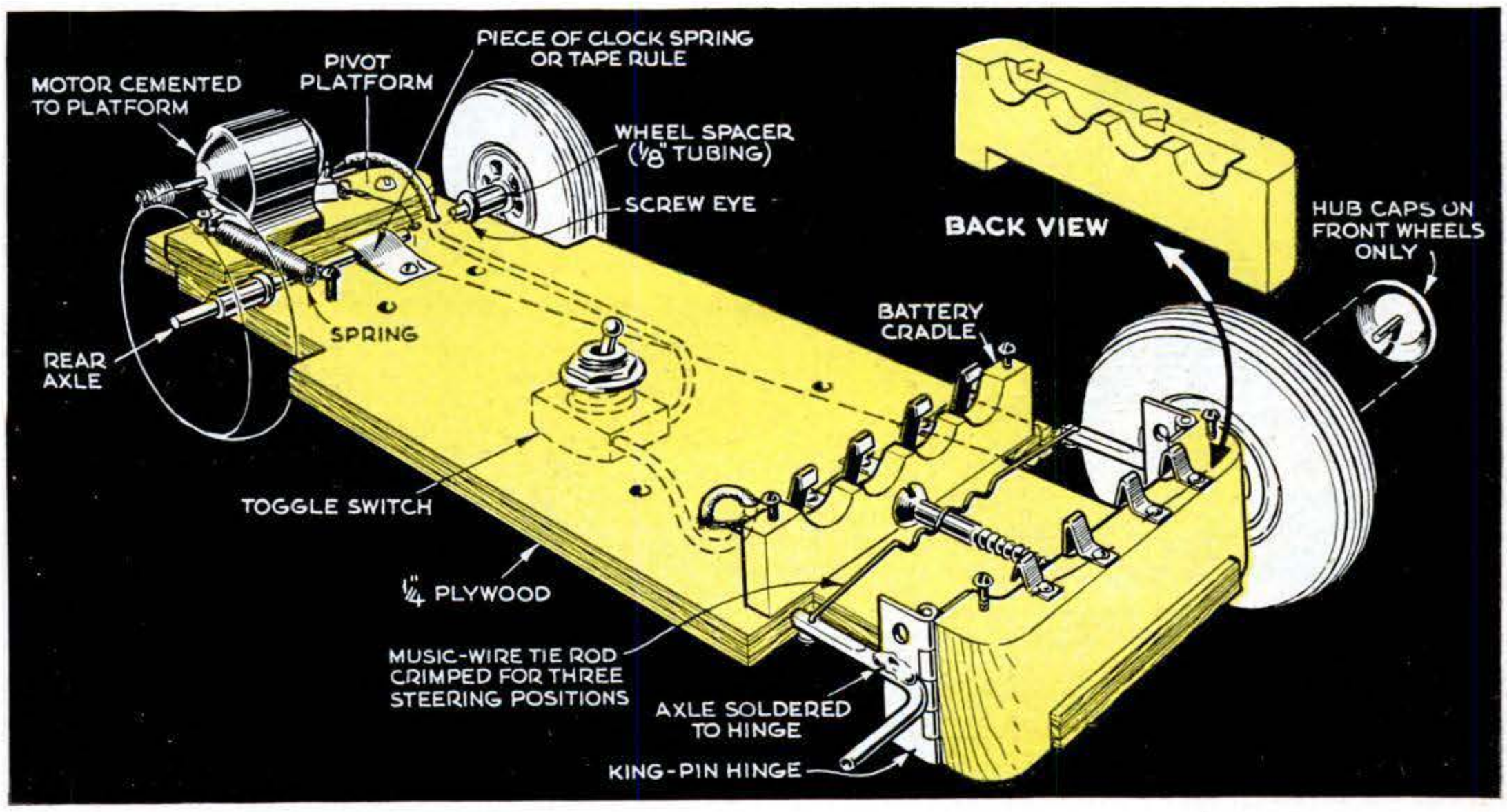


The chassis, or motor board, is ¼" plywood. Two strips of pine, gouged to form a battery cradle, are screwed to the board. The front strip supports the "king-pin" hinges and front axles. A length of piano wire and a wood screw form the three-position steering linkage. The motor mount is pivoted on one screw and spring-loaded so the friction drive—a pencil eraser on the motor shaft—will maintain constant pressure against the rear right wheel. The power plant is a 1.5- to 6-volt miniature permanent-magnet motor driven by four series-connected pen-light cells. The motor is cemented to the pivoted strip. The rubber-tired model-airplane wheels have ⅛" axle bearings. The axles—two in front, one in back—are ⅛" rod. The front wheels turn *on* the axles, the rear wheels turn *with* it. The ends of the rear axle are burred with cutting pliers and the wheels are driven on tight.



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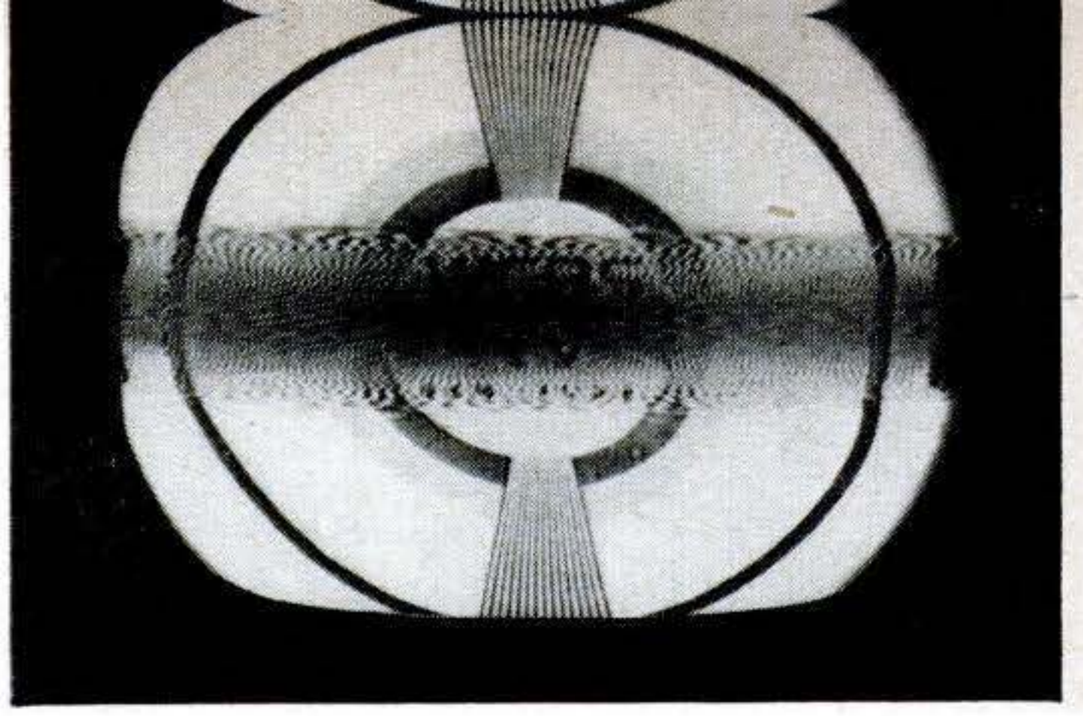
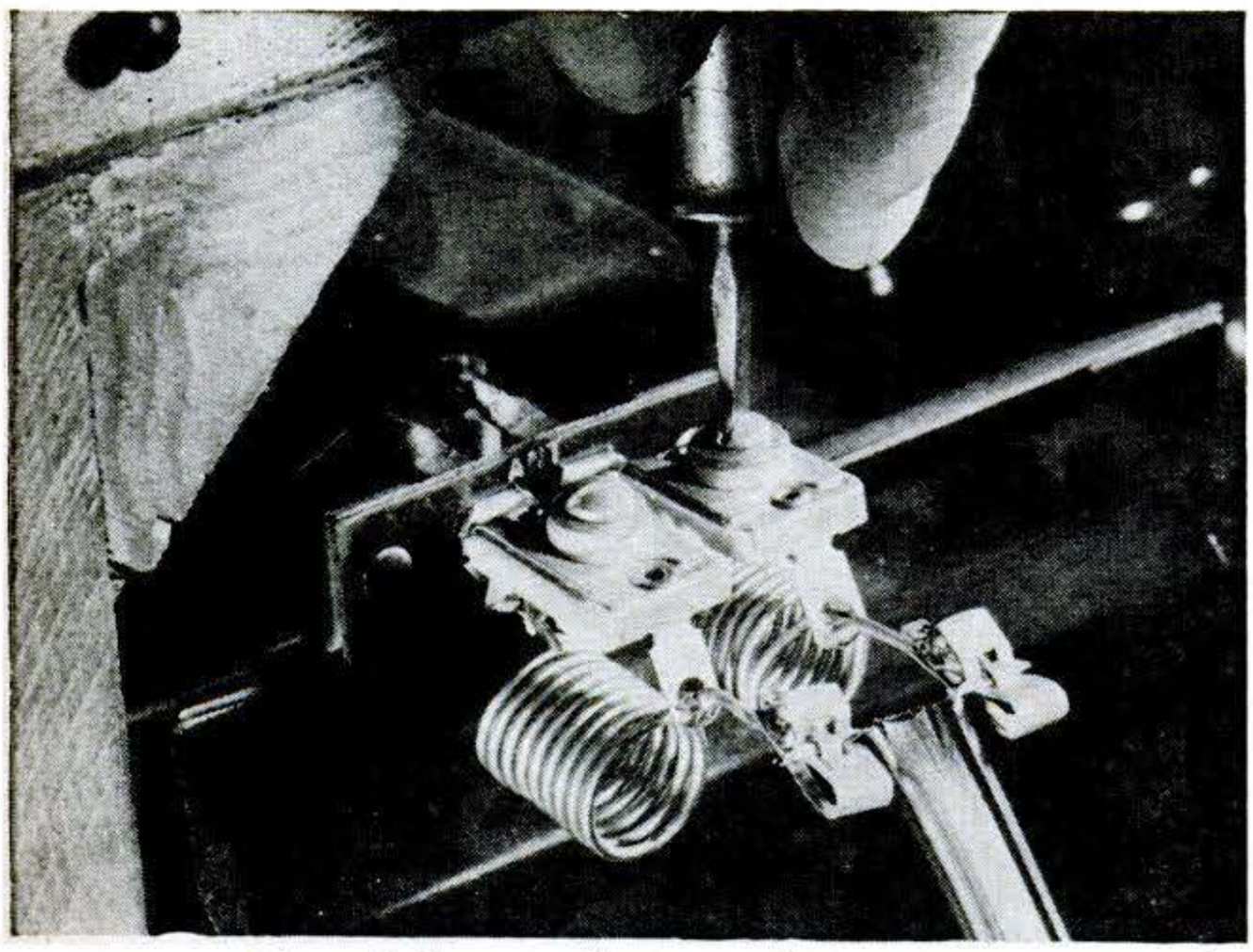
Homemade gadgets, made of scrap parts, can trap or filter out the flying hash that messes up many video screens.



How to Stop TV Interference



Install traps close to the antenna terminals. Use two identical traps and adjust one, then the other, until interference is at a minimum.

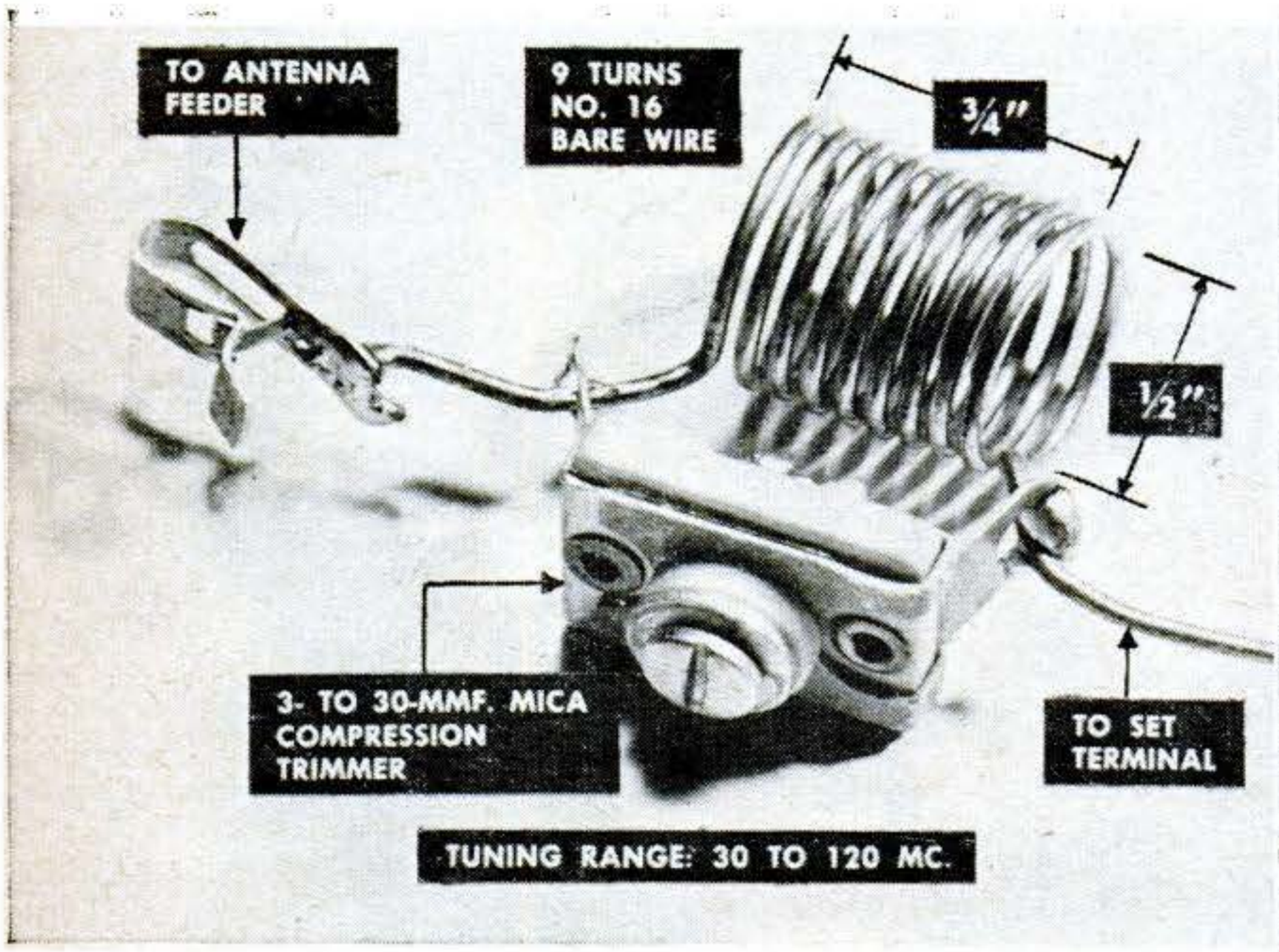
By Howard G. McEntee

IS STATIC interfering with your enjoyment of the pictures on your TV screen?

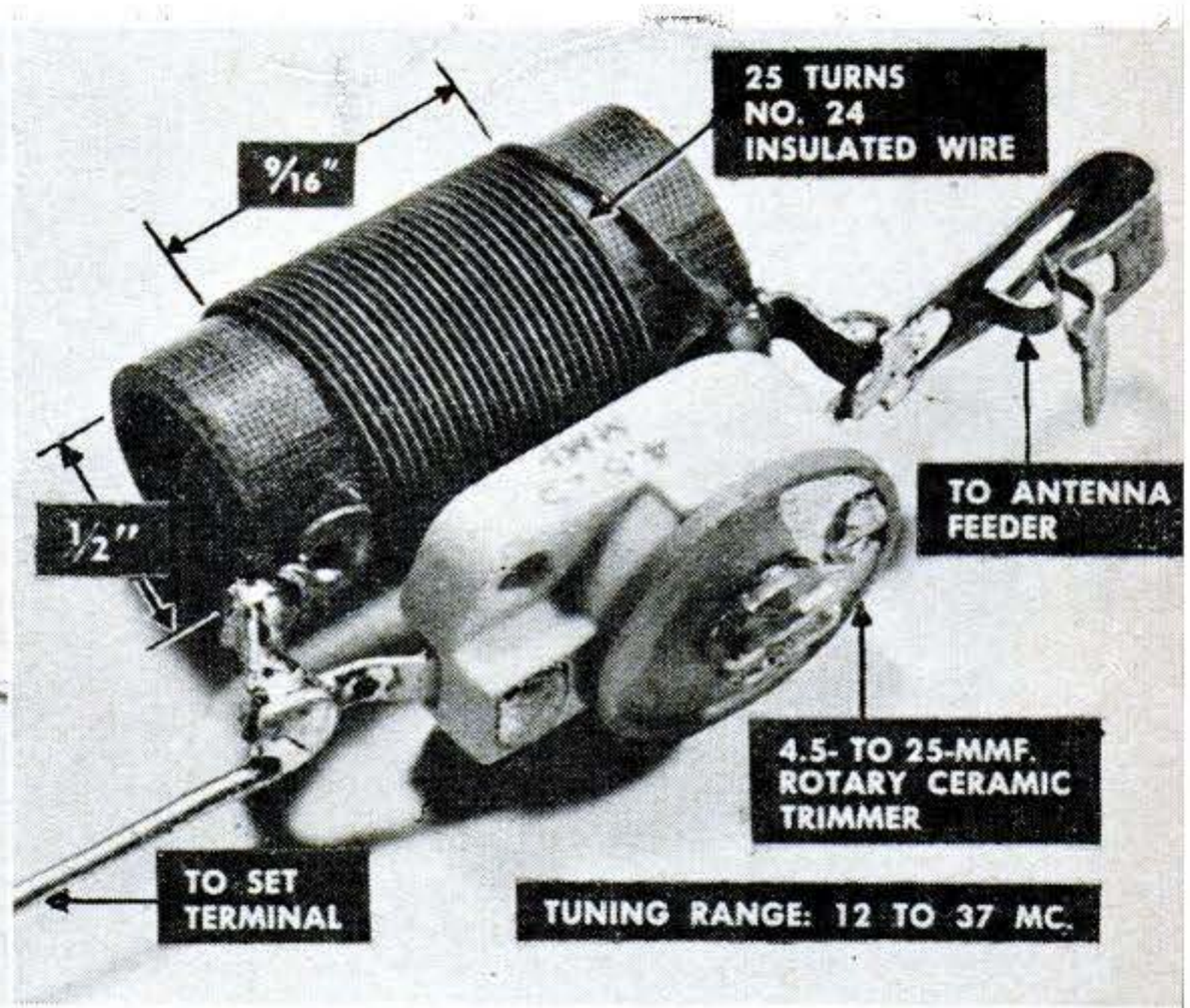
A pair of wave traps, or a filter that you can make for less than a buck, will sometimes eliminate the herringbone patterns, Venetian-blind slats, torn-up images, or shooting streaks that result from interference in television signals.

You cannot always tell in advance which of these noise-catchers will work best for you. But since they are simple to make, you can try out several of them without expending much time or money.

Traps tune out noise. Wave traps are particularly useful against the type of interference that comes from a single source and is uniform in frequency. A nearby police or ham-radio transmitter, FM station, or



Wide-range trap uses 25-cent trimmer, a coil and a clip. You have to make two exactly alike.



A different combination of coil and condenser lowers the frequency range of this trap.

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diathermy machine may be "breaking through" the tuned circuits of your receiver. Traps—which are additional tuned circuits—short-circuit the interference and help block out these unwanted signals.

First try the broad-band trap shown at bottom left of preceding page, which uses a postage-stamp trimmer. Make two identical units and insert one in each antenna feeder. Watch the screen and tune the trimmers until the interfering signal disappears. If the first pair doesn't clean up your picture, experiment with one or both of the other types shown. Since these traps cover specified frequency ranges, they may be more effective against the interference causing your trouble.

Interference sometimes sneaks into a teleset through the power cord rather than the antenna. Traps in both legs of the power line will close off this point of entry. But be sure to mount them in an insulated box.

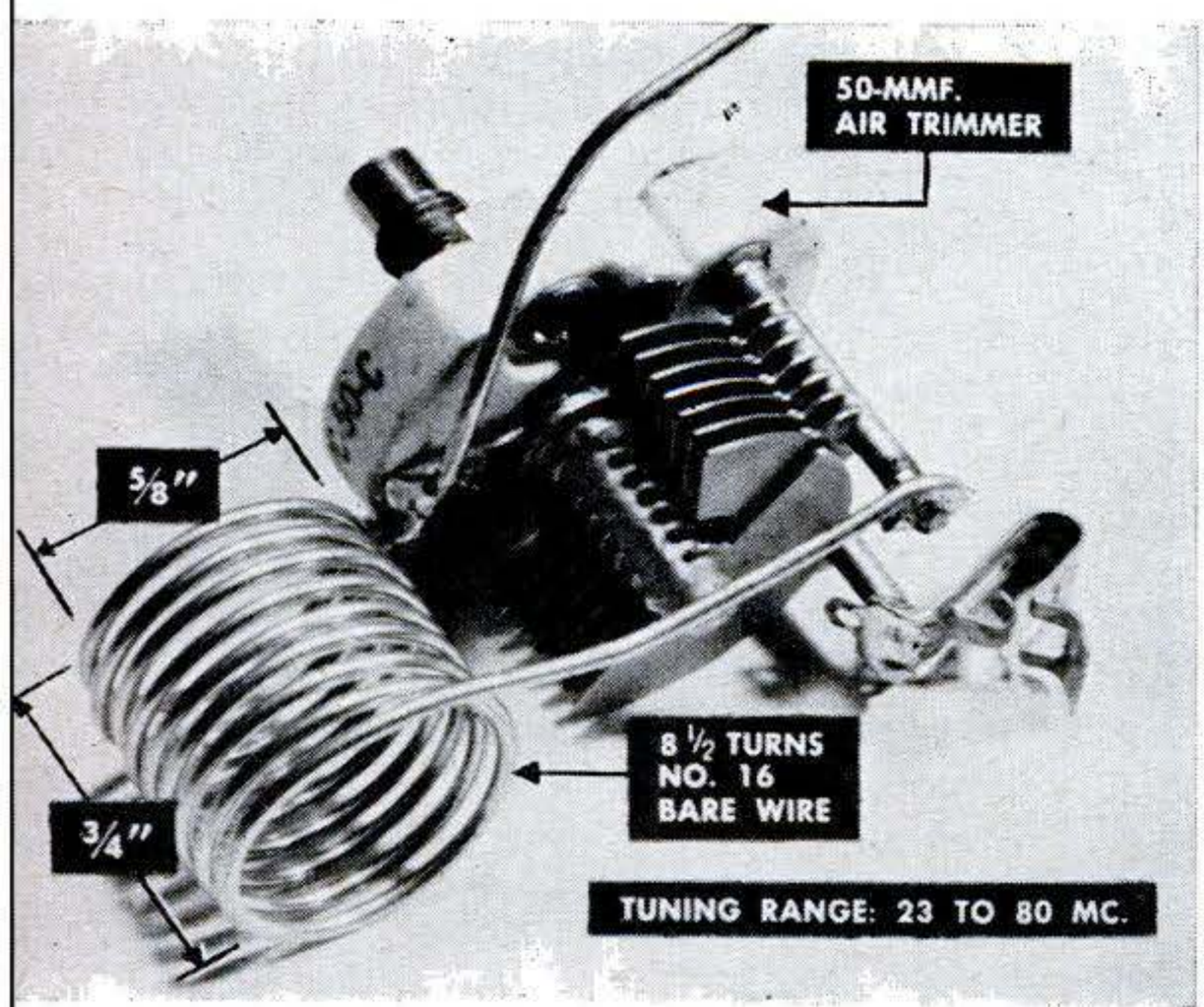
Filters are catchalls. Hit-and-run interference occurs even more often than the fixed-frequency kind. You can't tune it out with a trap because it skips around from one frequency to another. To get rid of it you have to block off the whole frequency band in which it appears. That's a job for a filter. The one shown at right below absorbs all signals below 40 megacycles. A lot of diathermy, police-radio, and car-ignition static falls in this range.

Arrange the coils and condensers on a plastic strip at least 4" long. (Squeezing the parts onto a shorter strip might cause the coils to interact.) Place the coils at right angles to each other. Connect the filter between the lead-in and the set terminals and clip the ground lead to the receiver chassis. This filter isn't tunable—you just install it and leave it alone. If it weakens interference but doesn't quite kill it all, enclose the unit in a metal box and ground the box to the chassis. END

Weak Signals Invite Interference

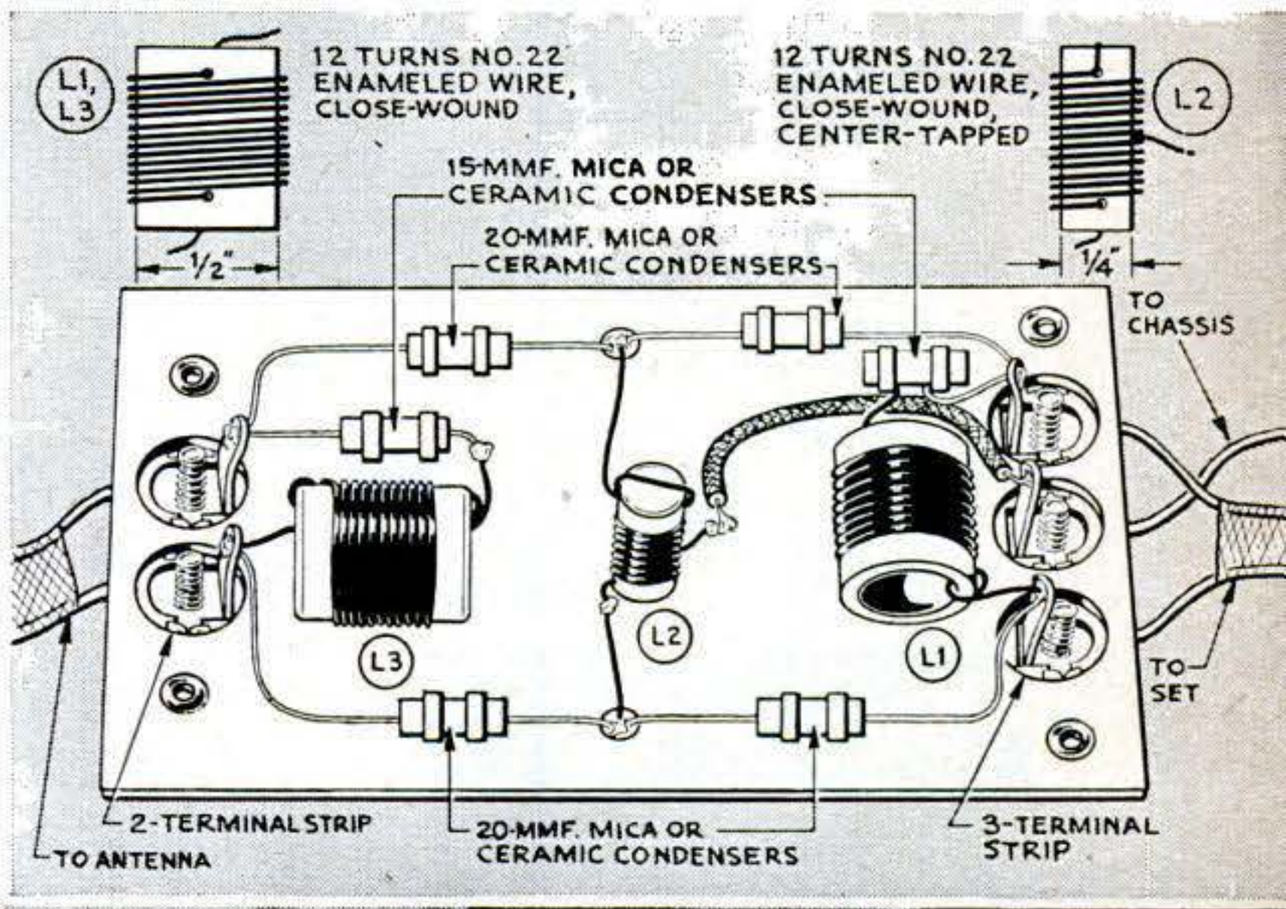
A STRONG signal is usually a good signal. If "hash" is getting into your picture, check your antenna and lead-in. Clean the antenna terminals. Make sure the lead-in is connected securely, and that both conductors are making good contact all the way down. Rotating the antenna may also help strengthen your signal.

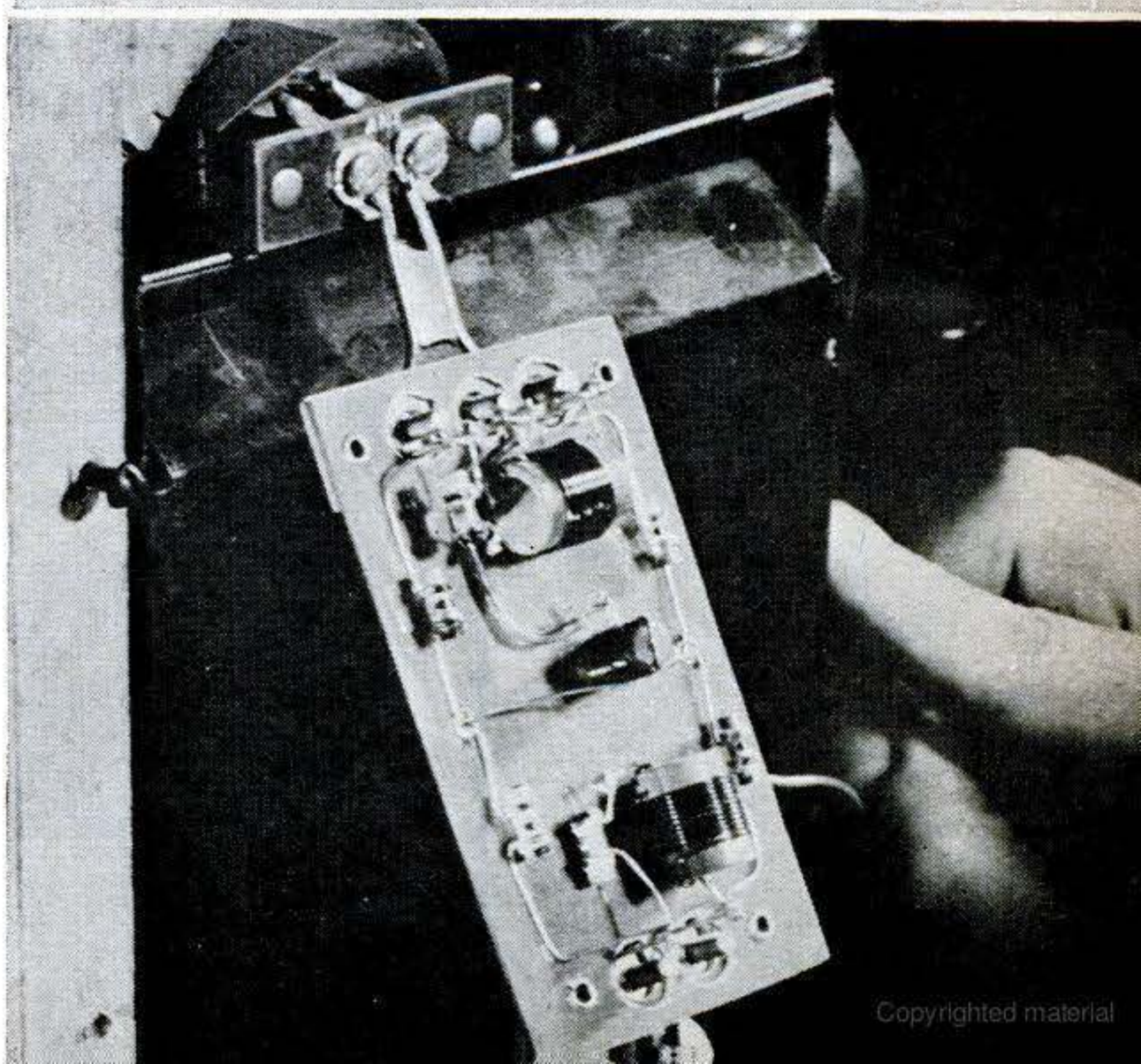
The lead itself sometimes picks up "noise," especially from car-ignition systems. If you live near a busy highway, install the lead as far from the road as possible.



This trap tunes very sharply and is most effective against some types of strong, local noise.

Filters block out hit-and-run noise below the TV band. If interference source is close and strong, shield the unit in a metal box.





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One-Evening

Candlelight Warms Food.

This attractive food warmer harmonizes with most table settings. It will bring a flicker of candlelight to your table and at the same time keep a teapot or casserole at ready-to-serve temperature.

You can make one like it from strips of aluminum or stainless steel and some tin-can stock. All frame parts are made from 1/16″ by ¾″ strips. Cut two 23″ long and drill ⅛″ rivet holes in the center of each strip and ⅜″ from each end. Bend the strips as shown to form the crossarm center supports.

Where the strips meet at the bottom, bend one over the other so all four legs will rest squarely. Insert the center rivet top up and countersink the bottom hole so that the rivet will be flush when it is peened.

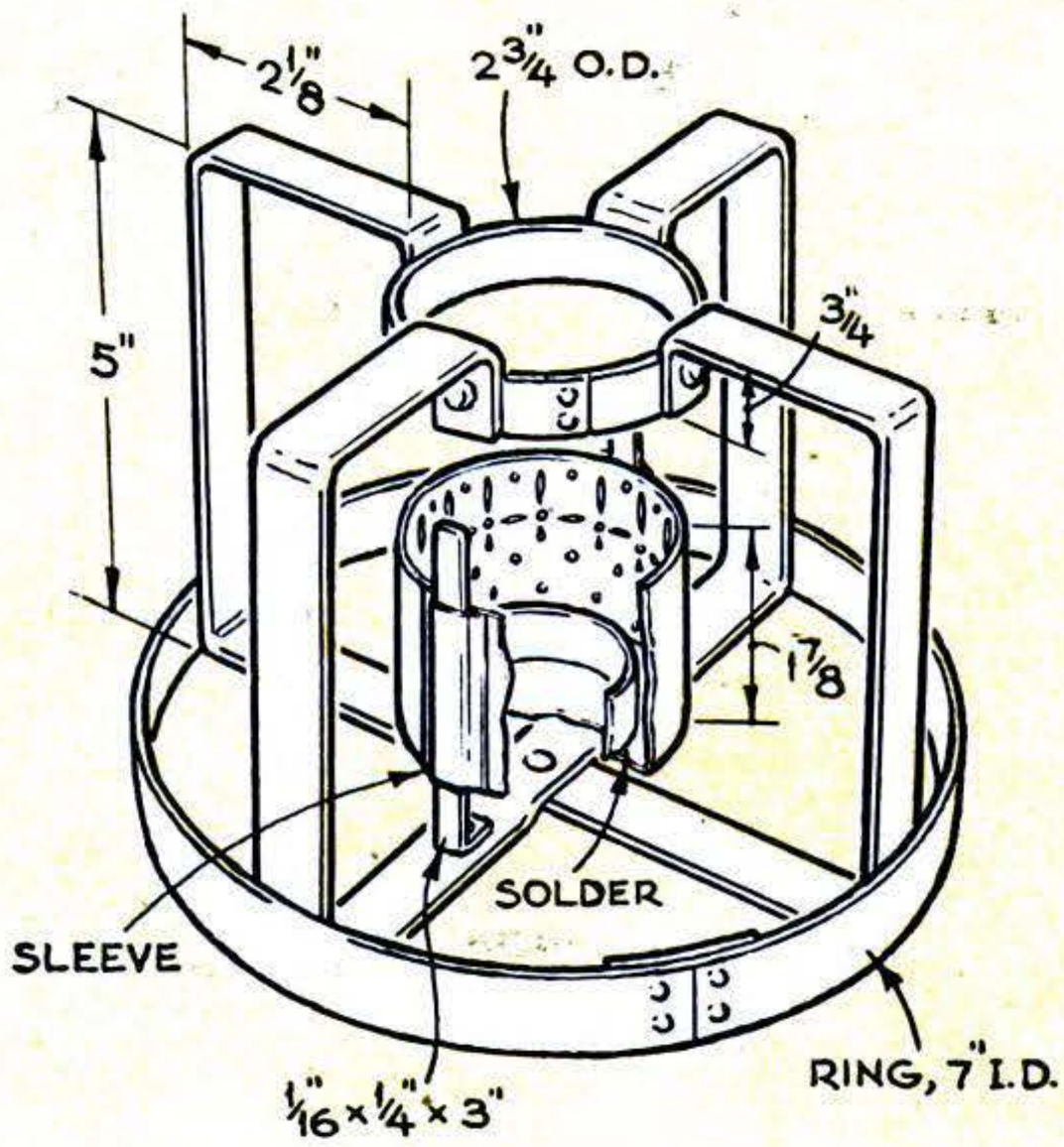
Make two rings of the same metal. One should fit between the turned-down portions of the uprights, the other around the base. Butt the ends of the rings and rivet them to short jumper strips as shown. Rivet the top ring in place and rivet or soft-solder the base ring.

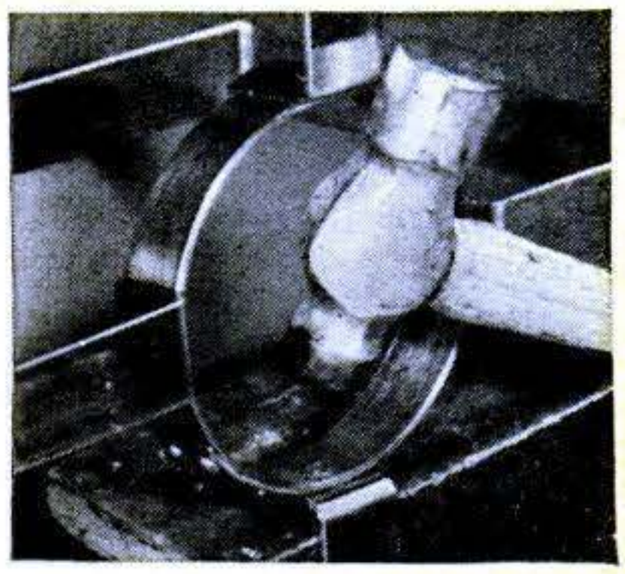
For the candle cup, trim a can of the size used for condensed milk to a height of 1⅞″. Punch a pattern of holes all around to admit air to partly consumed candles. Solder a ring inside the cup bottom to hold a candle.

The food warmer in the picture was polished and lacquered. You may prefer to hammer, paint or heat-blacken the metal to suit your own decorative scheme.

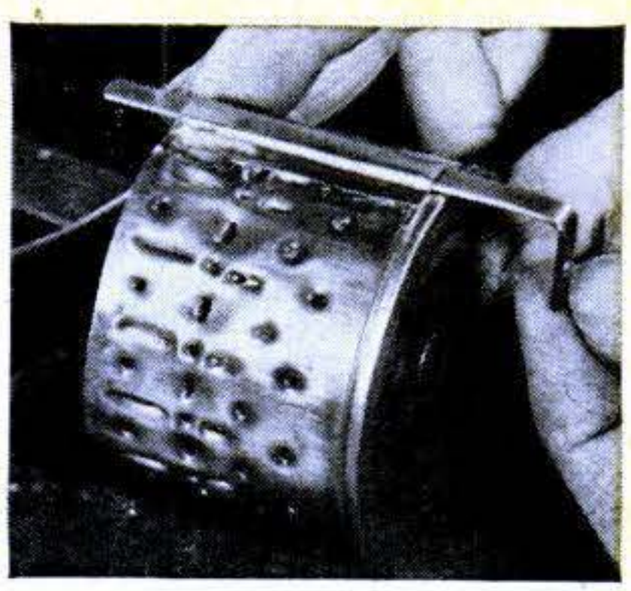
The candle that goes best with this warmer is the squat kind that is supposed to burn for 15 hours. If you want more heat substitute an alcohol lamp or a tin of solidified alcohol.

Building time: two hours.





Dish holder is a ring riveted flush with upper ends of crossarms to form flat surface.



Candle cup is supported by two upright strips that enter tinplate channels soldered to cup. Friction between strips and channels supports cup at any height.

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Shop Projects

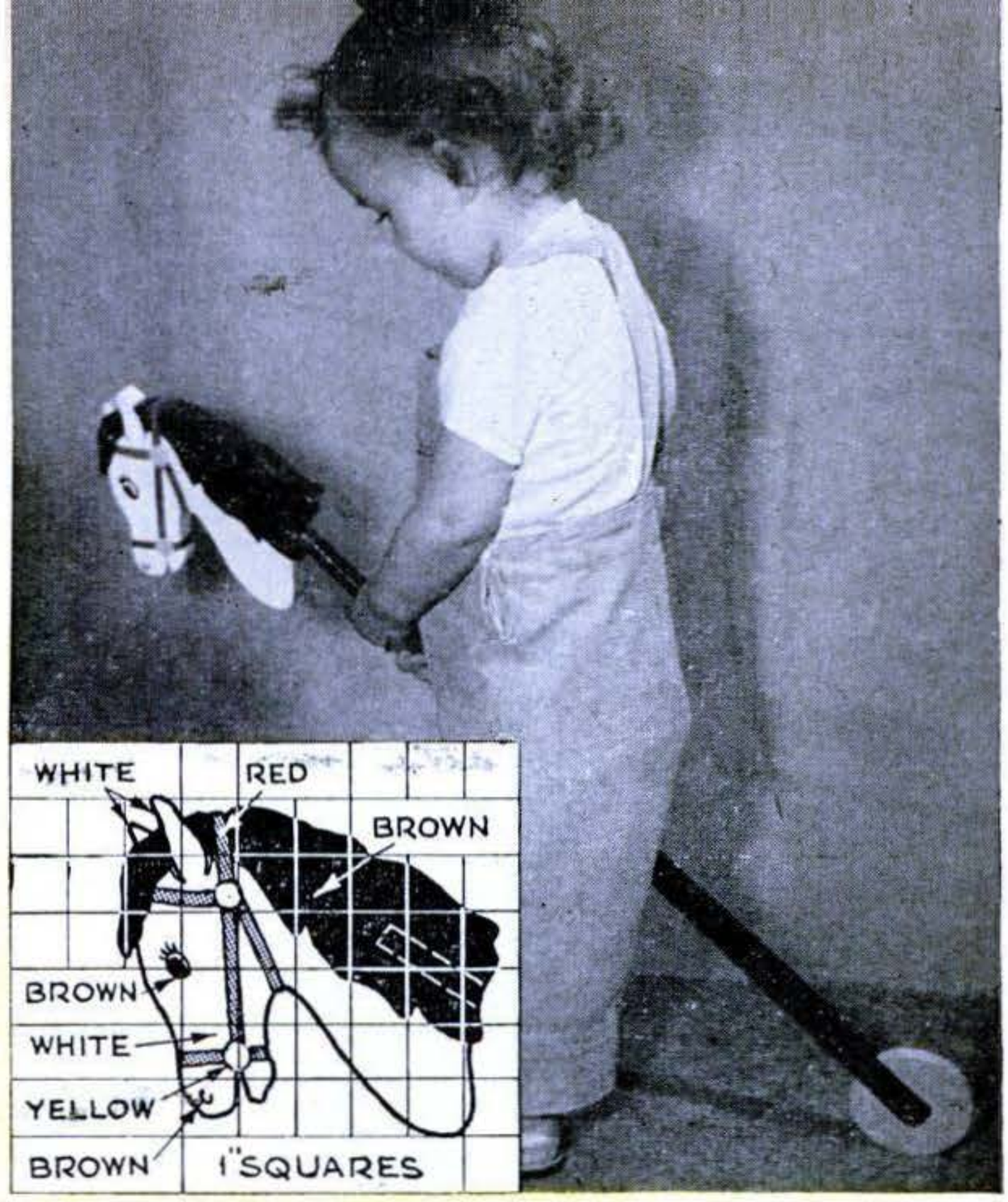
Give a Man a Horse He Can Ride. This steed will take your youngster where he wants to go lickety-split. If you start on it tonight, he can gallop in to breakfast in the morning.

The board from which the head is jigsawed should be finished on both sides and measure at least 1″ thick after it is sanded smooth. For the stick use a broom handle or about 27″ of ¾″ hardwood dowel. Cut a 7/16″ by 3″ slot for the wheel and drill the slot to take a ¼″ bolt that serves as an axle. Jigsaw or turn the wheel from ⅜″ plywood.

Smooth all parts, taking special pains to round off sharp corners. Apply a primer coat of pigmented shellac.

Trace off the drawing detail and fill in the colors with bright, fast-drying enamel.

Building time: one hour.



Tray Serves Memories. Intended to start summer sailors swapping yarns of the sea, this tray has a chart of local waters cemented to its surface.

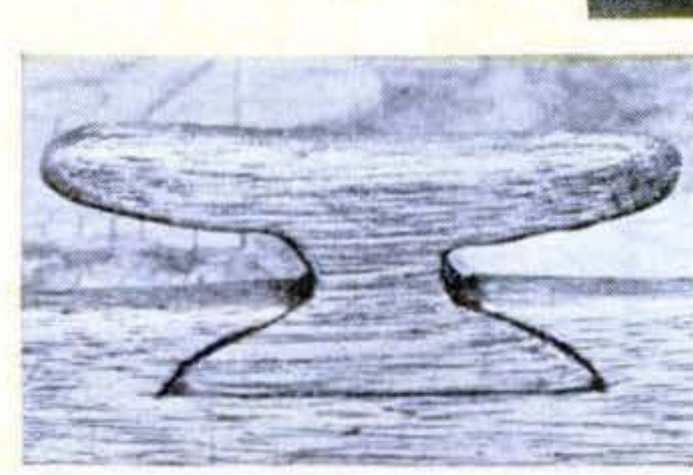
The tray is made of African mahogany—a beautiful boat timber. The sides are ¾″ by 2½″ strips measured to fit the chart, rabbeted at the bottom for a sheet of ⅛″ composition board, and joined by dovetail joints. Clamp two scraps of the stock together and saw out cleat-shaped handles. Use them to outline the matching cut outs in the tray ends.

Assemble the parts with waterproof glue and add a few brads to secure the bottom. Sand all corners and edges round.

Stain and fill the wood and apply a thin coat of shellac to the frame. Finish the whole tray with three coats of clear varnish.

Building time: 1½ hours.

Dovetails are made square, then rounded off. Rabbets do not extend to ends.



Cleat handles have rough-hewn nautical look. They are cut by hand. The tray ends are cut to match and handles are glued in.

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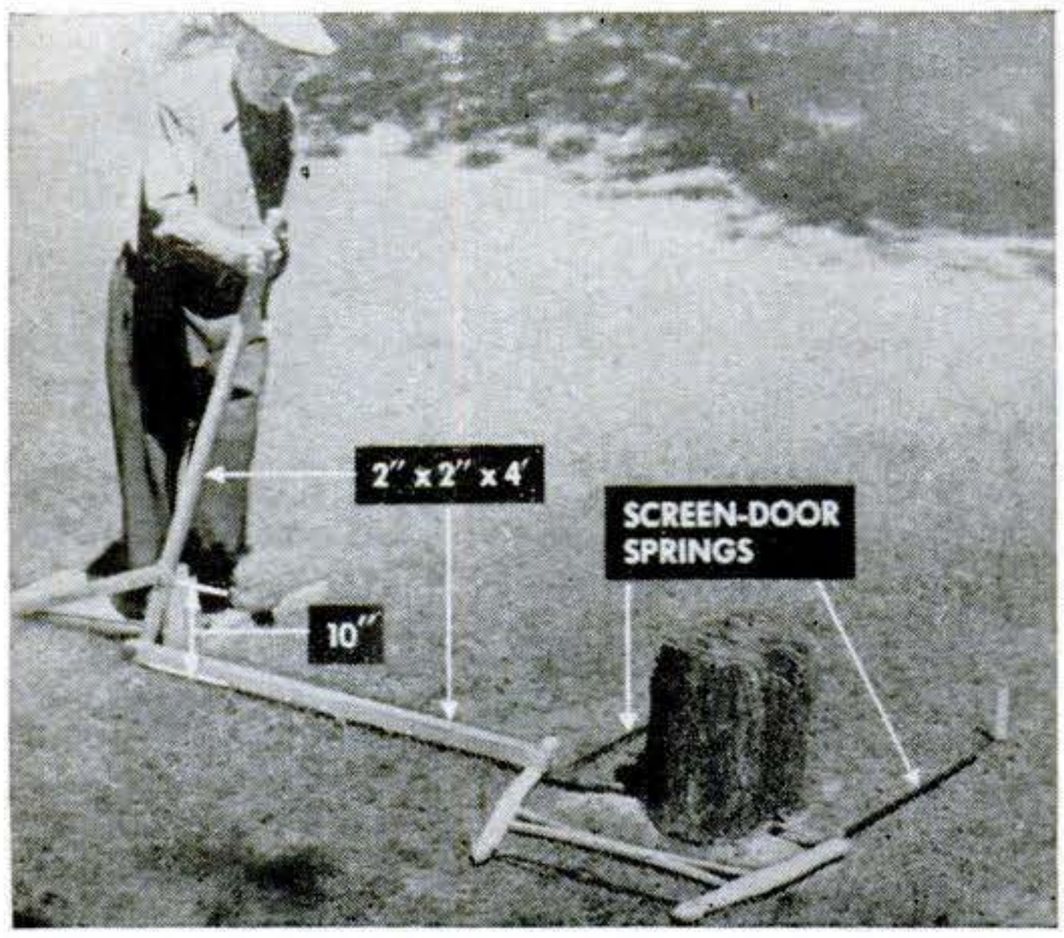
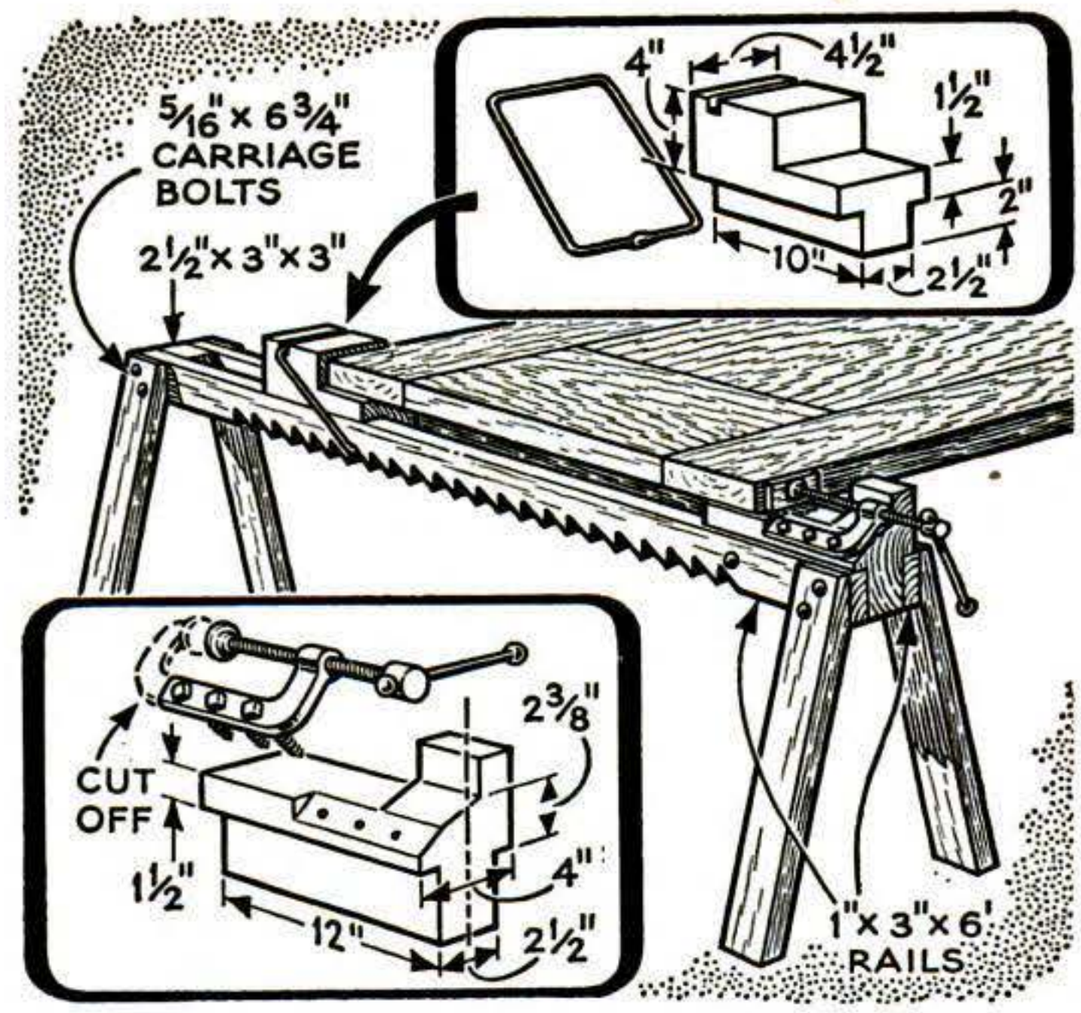
Lever Rig Saws Stump Flush

GETTING down on your knees to cut off a stump level with the ground is an open invitation to a stiff back. That's why I rigged this setup (below). Moving the lever works the bucksaw while the springs hold the blade against the stump. The spring stakes are reset to increase tension as the cut advances.—*C.A. Veburg, Omaha, Neb.*



Steel Wool Strains Fluids

A WAD of fine steel wool loosely packed into the neck of a bottle will strain out sediment in a liquid. I have used this dodge for straining cleaning fluids, developing solutions, roller-cleaning solvents, and thinners used to clean paintbrushes.—*George Kapitan, The Bronx, N.Y.*

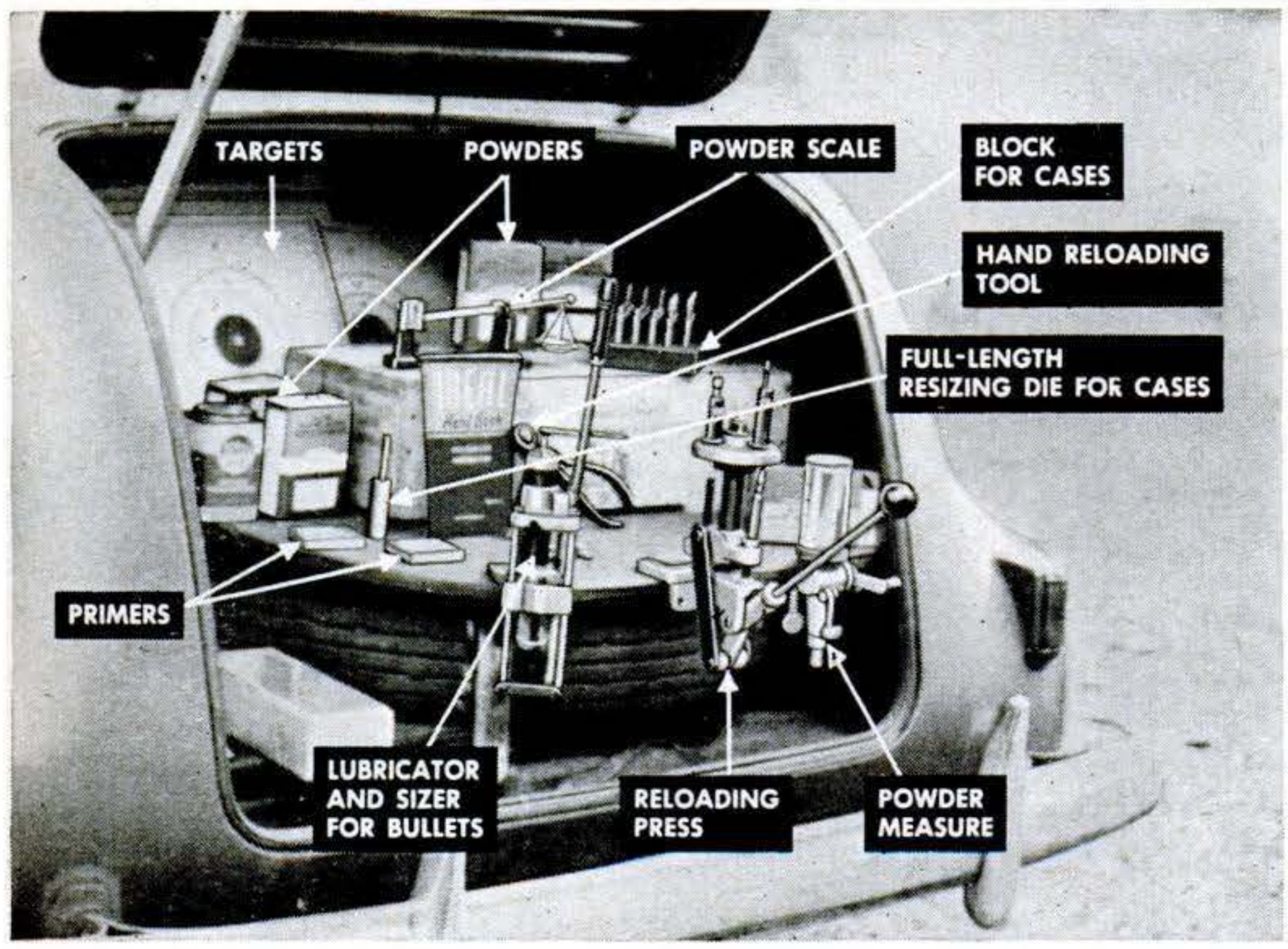


Gluing Clamp Is Like Sawhorse

A PAIR of gluing clamps like the one above is invaluable in any shop that has frequent edge-gluing jobs such as doors or table tops. Since each clamp amounts to a sawhorse, the pair acts as an assembly table and saves on bench space.

Two notched rails are held apart at one end by a 2½" spacer and at the other by an L-shaped block. The legs are bolted to rails and separators. A cut-off C clamp is lag-screwed to the block, and another hardwood block with a 2½" foot to ride between the rails acts as the second vise jaw. A rectangle of heavy wire, its ends welded or brazed together, locks the movable block to the rails at any desired point.—*R. E. Hancock, Portsmouth, Va.*

"Shop" in Luggage Compartment Reloads Ammo in the Field



HERE is a handy setup for hunters and target shooters who reload their own ammunition. The tools needed are mounted on a piece of plywood that is bolted on top of the spare in the car's trunk. Complete equipment is provided so that a shooter can adjust the load to suit conditions on the firing range or in the woods. The reloading tools pictured are made by the Lyman Gun Sight Corp., of Middlefield, Conn.

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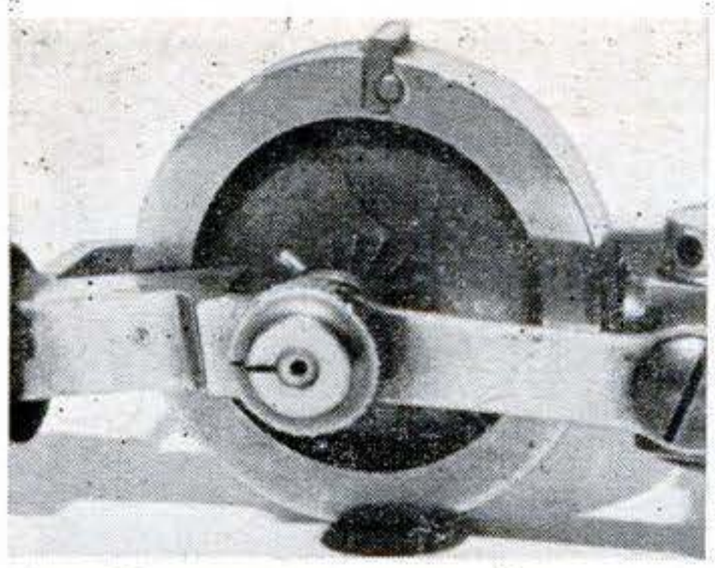


Small gear linkage above was shot as at right. Aperture guide on rear camera determines correct lens stop. Extreme bellows extensions upset basic "f" relationships.

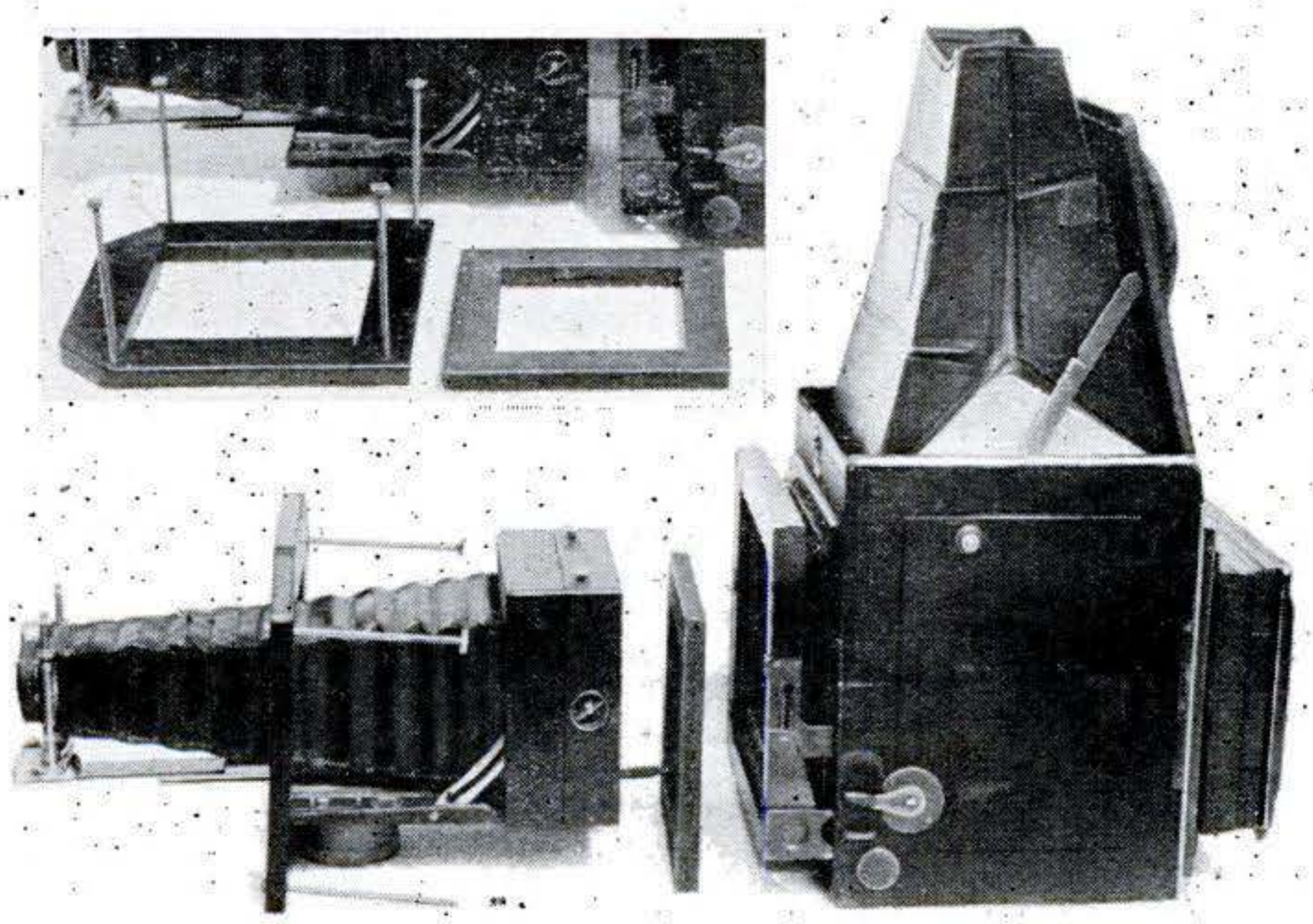
Tandem Cameras Shoot Pictures Bigger Than Life

HAILSTONES big as snowballs. Rosebuds the size of your fist. Miniature models several times their actual size.

That's how you can photograph small things with two bellows cameras. Mount one in front of the other. The extra bellows lets you move in close. Your subjects are magnified, and the images on negatives can be four or five times the size of the original.

The accompanying photos show how I do it. The rear camera is a 5″ by 7″ Graflex, the front one an old 3¼″ by 4¼″ plate camera with triple-extension bellows and 5¼″ lens. You can do the same with any two cameras of comparable size variation.

The rear camera must have a removable lens board and a front opening roughly equal to the rear of the other camera. If the lens-board opening is too small, it will cut off part of the image.



In my setup, a rectangular gasket cut from a kneeling pad forms a light-tight seal between the cameras. A wood flange smaller than the body of the front camera has bolts that are fastened through holes in the lens-board mount of the rear camera. Turning up the nuts clamps the cameras together.

A stout tripod is required to keep the assembled cameras rigid.—*Emery G. Gregory, Reedsburg, Wis.*

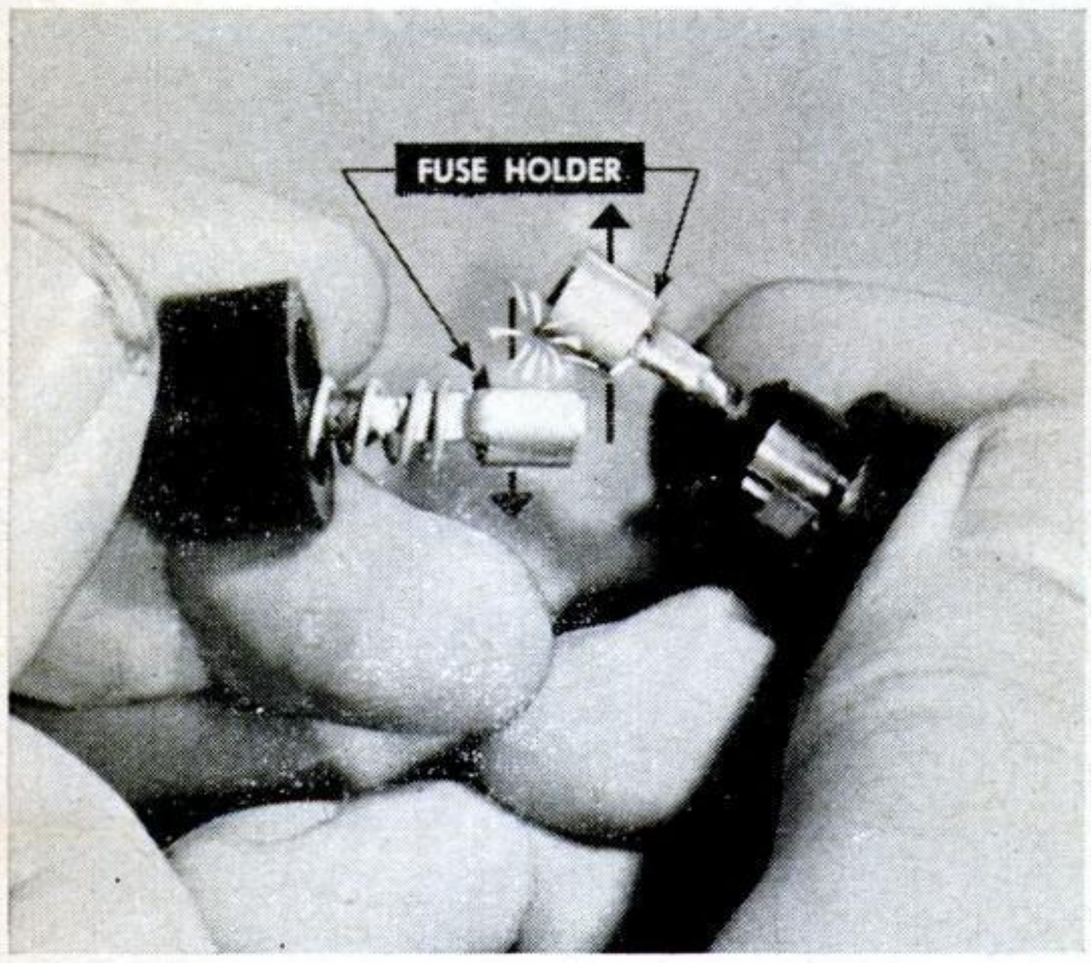
Shelf Attached to Tripod Holds Projection Slides

IF YOU mount a slide projector on a tripod, this shelf cut from fairly stiff sheet metal will provide a convenient place to set the slides. Put a slotted tab at one end of the sheet and slip it over the tripod screw, fastening the projector on top.—*Jim Miller, Moline, Ill.*

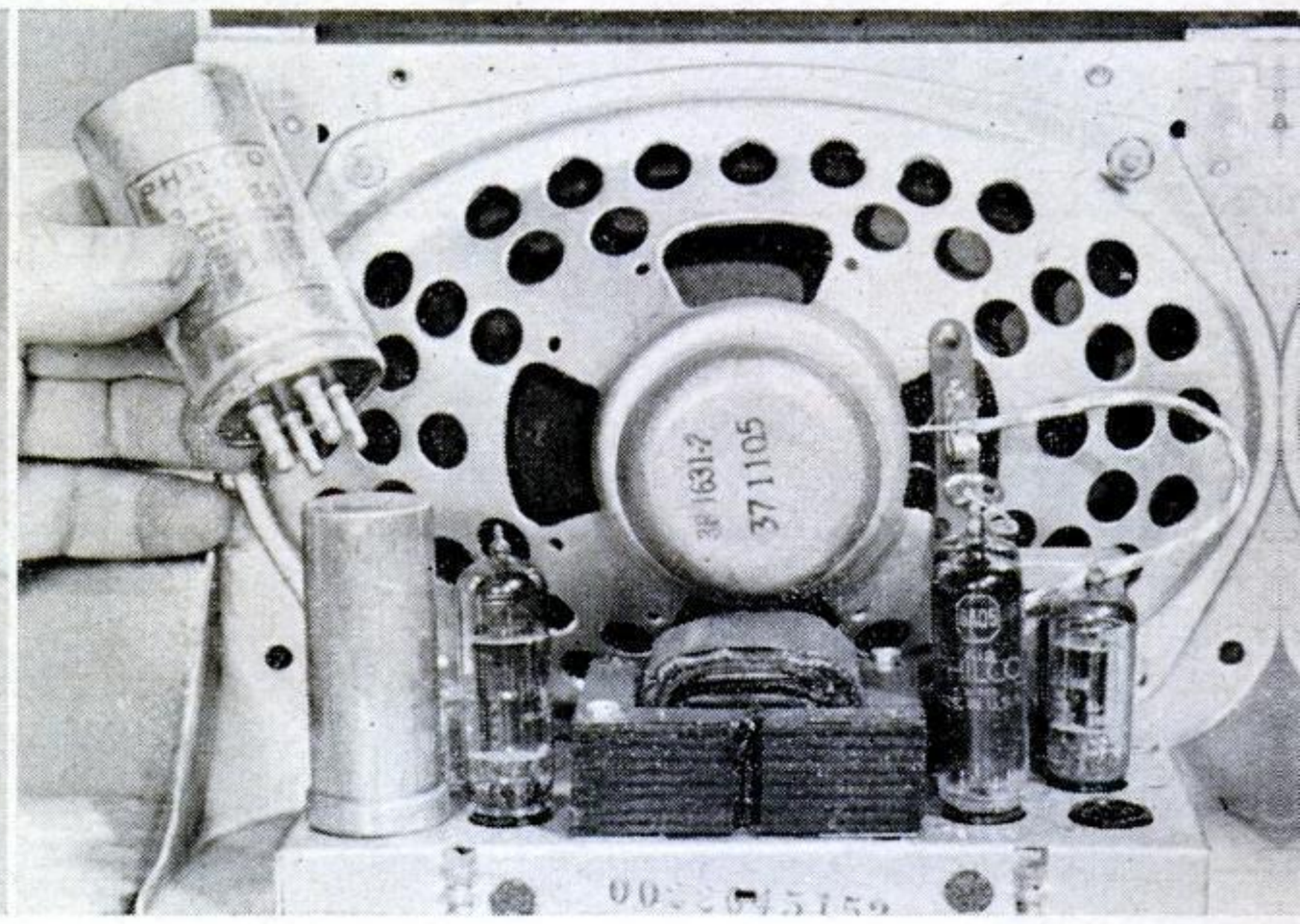
A crawl-under-the-dash repair job may be all that's needed after the trouble is diagnosed.

How to Service Your Auto Radio

"Flashing" the contacts of a fuse holder sometimes puts stuck-together vibrator points back in operation. Strike the metal clips together quickly, but *do not* hold them together.



The vibrator, a plug-in can, is the heart of the set's power supply. Listen for vibrator hum. Whether you hear it or not is an important clue to where to look for trouble.



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When a set goes flooey, check these trouble spots before you call a specialist. Often you can start it perking with a simple, no-cost fix.

By Robert L. Rosekrans

A MODERN car radio is so well made that it's easy to forget that there's a lot of mechanism behind the panel. When a set acts up, you realize that all you know about it is how to play it.

But this still doesn't mean you have to buy a repair job when it quits playing. Even if you've never looked behind the dash, you often can find and fix the trouble yourself.

Testing in the car. If the set is completely dead, park the car in a quiet place and listen for a low, muffled hum. It comes —or should come—from the vibrator, an automatic switch that interrupts the six-volt DC from the battery and makes it act like AC.

The absence of vibrator hum means (1) the radio fuse is blown, (2) there's an open circuit in the "A" cable that feeds juice to the set, or (3) the vibrator itself is faulty.

Look for the fuse holder. It may be built into the case or it may be part of the "A" cable. Replace the fuse with one of the same ampere rating, as marked on the metal fuse ends.

Keep in mind that a blown fuse is usually a symptom rather than a cause of trouble. Defects in the vibrator or its associated circuits may cause the new fuse to blow as soon as you put it in. If this happens, it may indicate that the contact points in the vibrator have become lightly welded together. Pull back the insulated ends of the fuse holder, and strike the metal clips together. A surge of electricity sometimes frees stuck points.

If the vibrator still doesn't hum and the fuse doesn't burn out, inspect the "A" cable. Look for frayed or bent sections that might cover a break in the wire. And examine the lug-and-nut connection at the ignition switch or ammeter. Make sure it is tight and clean.

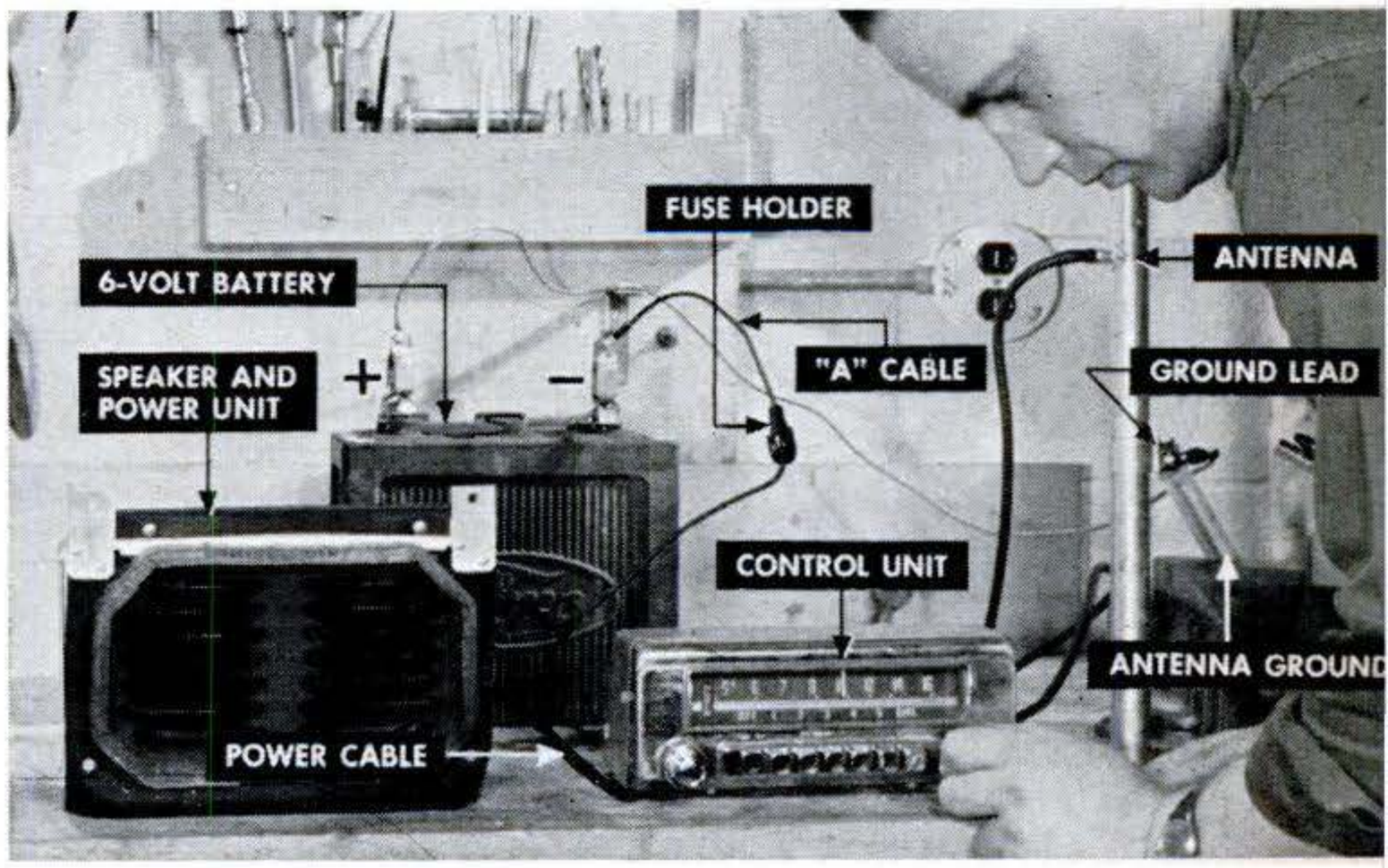
If the set is dead but the vibrator hums, check the antenna. The lead from the outside whip is usually connected to a socket on the receiver chassis. The socket may be marked, but even if it isn't, you can easily locate it by tracing the cable that comes from the whip antenna. Unplug this lead. Bare the tip of a length of insulated wire and insert it in the antenna socket. Make sure the bare wire does not touch the case or any car metal. Hold the other end of the wire in your hand. If the set starts to play, the antenna is faulty. The whip or the lead-in may be open or shorted to the car body. Check the lead, and, if necessary, replace first the wire, then the antenna itself.

Auto sets sometimes come complete in one package, like little home radios. More often they are built in two or even three units. It is common to find the speaker, vibrator and power supply in one metal box. The rest of the set may be in one unit or the tuning controls may be separate. If your set consists of more than one unit, see that all the connecting wires and cables are intact. Sometimes they get in the way and are yanked loose when you open a ventilator or pull on the hand brake.

Testing on a bench. If these in-car checks do not reveal the trouble, you'll have to take out the set for bench tests. Most sets are designed for easy removal. Bring the fuse in, along with each set unit if they are separately cased.

Borrow the storage battery, too, or if you

Bench tests may be needed to track down some troubles in a car radio. The set may be built in one, two or three units. All must be removed and properly connected to a battery, antenna and each other. Look for unlighted or cold tubes.



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have a garage workbench, rig up leads from the battery. Note the terminal connections; in some cars the positive pole is grounded and in others it's the negative. When you bench-test the receiver, connect the "hot" side to the radio "A" cable and the ground side to the metal case of each of the receiver units.

Listen again for vibrator hum. If there is none, wiggle the vibrator in its socket or lift it out and reseat the prongs firmly. If it refuses to buzz you can replace it with another of the same type and part number but you may be gambling the price of the unit. A defective vibrator, like a burned-out fuse, is more often a symptom than a cause of trouble, so the new one may burn out very quickly. To play safe, let a serviceman check the set after you have spotted vibrator trouble.

If the vibrator hums but the set doesn't play, the next thing to look for is burned-out tubes. Replace any tube that doesn't light or warm up.

Interference and Static. Auto radios are subject to a lot of static from inside and outside the car. The worst kinds can be eliminated but you may have to learn to live with some of the minor ones. Static produced by the car's electrical system is easy to track down. Tune the set to bring maximum interference; then turn off the engine. If the noise dies with the engine it probably originates in the generator or in the ignition.

Generator noise is a fairly regular hum. *Ignition noise* has a sharp, crackling quality. Both start at fairly low frequency and increase noticeably in pitch as the engine is speeded up.

If you suspect the generator, check the connections to the generator condenser. One terminal is usually the metal saddle that holds it to the generator, the other is an insulated wire. Both terminals should make firm contact.

If cleaning and tightening the terminal contacts doesn't eliminate the noise, replace the condenser. Persistent generator noise that can't be suppressed by the condenser may mean the generator commutator needs turning down.

Ignition noise is often caused by a loose or poorly connected high-tension wire. It may be at the distributor, spark coil or plugs.

Some of the noise generated under the hood works its way through the radio's power supply, some is picked up by the antenna or lead-in. Tune in as much noise as you can and disconnect the antenna plug at the receiver. If the noise disappears with the signal, examine the lead-in. Make sure that its shield is grounded.

Static electricity generated by the movement of the car is often heard as erratic, irregular popping. It rarely shows up on rainy days.

Dry-weather static usually can be traced to the curb feelers or tires. Bend the feelers up a little further from the ground and inject

AUTO-RADIO INTERFERENCE

If the noise you hear is:	Look for:	Then do this:
Low hum that rises in pitch as engine speed increases	Generator interference	Shut off engine. Noise should stop. Check connections on generator condenser. Replace condenser.
Sharp crackling that rises in pitch as engine speed increases	Loose high-tension wire at distributor, coil or spark plugs	Tighten connections.
Intermittent popping that does not appear on rainy days	Static electricity—generated by curb feelers or tires	Bend up curb feelers. Inject static-suppressing powder into tires, including spare.
Crackle like ignition static, but does not disappear when you shut off engine	External interference from streetcars, power lines, etc.	Retune set.
Hiss that accompanies programs from weak or distant stations	Background interference	Retune set.

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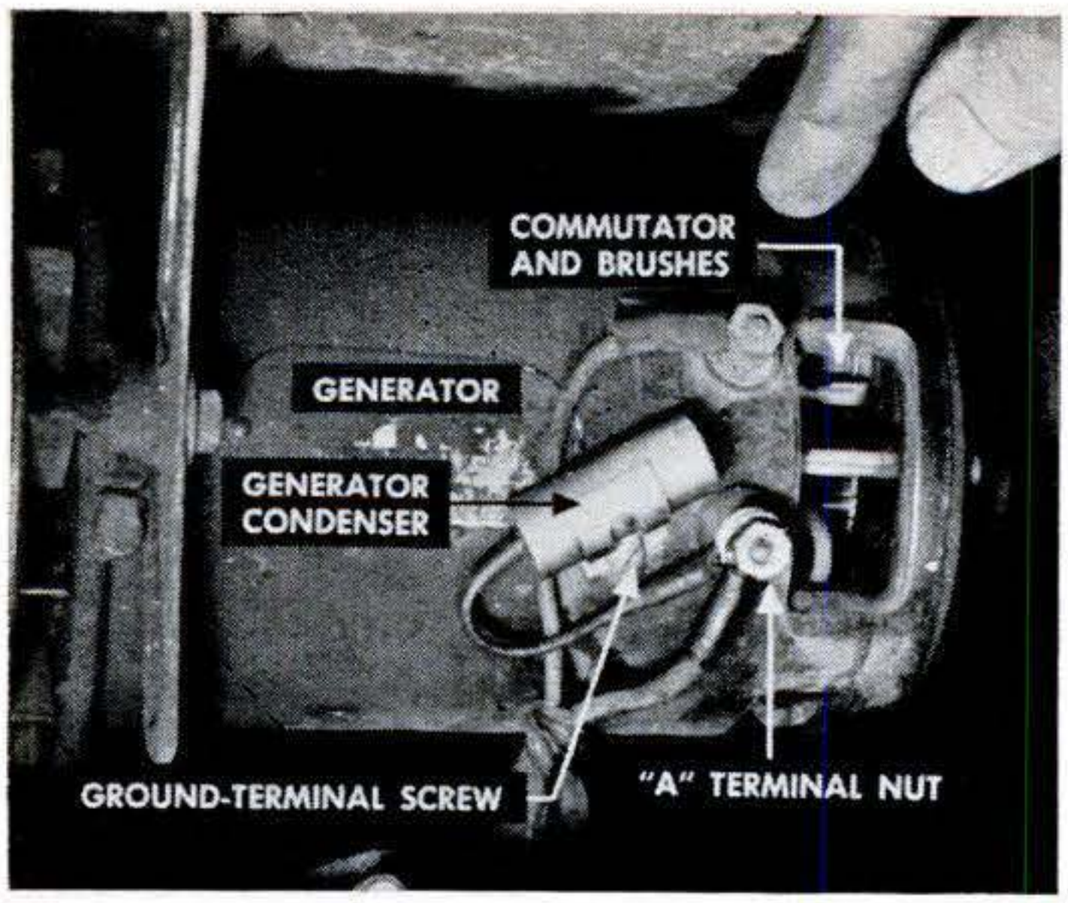
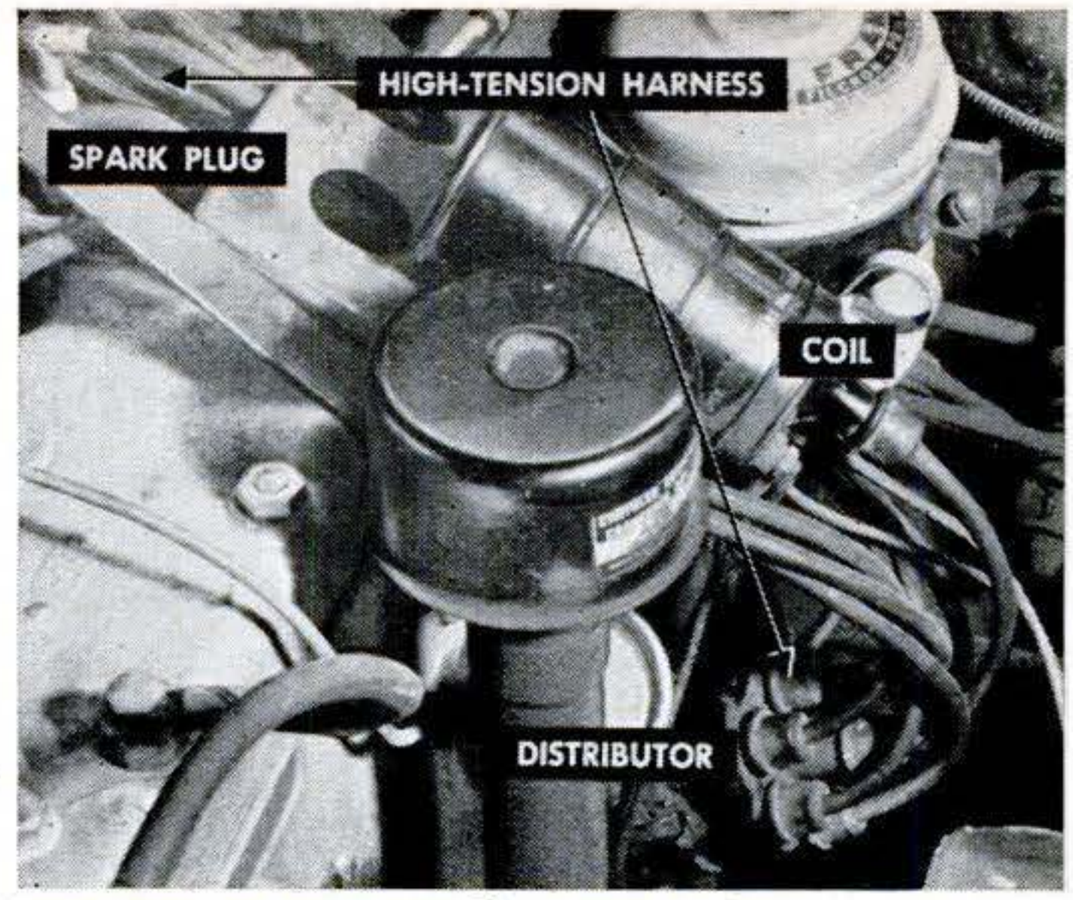


A faulty generator or condenser may produce car-radio noise. Clean and tighten the condenser contacts. If this doesn't help, replace the condenser with an exact duplicate.



Ignition noise usually comes from the high-voltage electrical system. Check all connections at the coil, distributor and spark plugs, and tighten any that seem to be loose.

anti-static powder into the tires. Don't forget the spare.

Background noise varies with station distance and atmospheric conditions. To test it, stop the car and fish the dial for a stronger or closer station. If the noise disappears, you might as well write it down to a weak signal and forget it.

External interference is most common in cities. You notice it when you drive near streetcars, electric signs, busses and some factories.

There's not much you can do about background or external noises, but being able to recognize them will make it easier to track down other troubles that you can do something about.

Mushy sound—you get stations but they sound terrible—can be caused by trouble within the receiver, but most often it comes from a bad speaker. (Vibration, temperature changes and running the set at a high volume level are all apt to damage voice-coil alignment and the cone itself.) For a comparison check, try to borrow a good speaker of the same kind. Also examine the cone for tears. Speakers usually can't be repaired satisfactorily; a replacement is best. END

Next Month: Ways you can use sound-powered phones in your home, shop and garage.

AUTO-RADIO REPAIR

If complaint is:	Look for:	Then do this:
IN-CAR CHECKS		
Set is completely dead (no vibrator hum)	Blown fuse	Replace fuse.
	Open "A" circuit	Examine cable for break or loose connection.
	Defective vibrator	"Flash" fuse contacts.
Vibrator hums but set doesn't play	Short or open circuit in antenna	Substitute length of wire for antenna; check antenna lead.
BENCH CHECKS		
Set is completely dead (no vibrator hum)	Defective vibrator	Wiggle vibrator in socket.
		Replace vibrator or have set checked by serviceman.
Vibrator hums but set doesn't play	Burned-out tubes	If no tubes light, check interconnecting cables between receiver units.
		If some tubes light, examine all for filament glow or feel for warmth. Replace unlighted or cold tubes.

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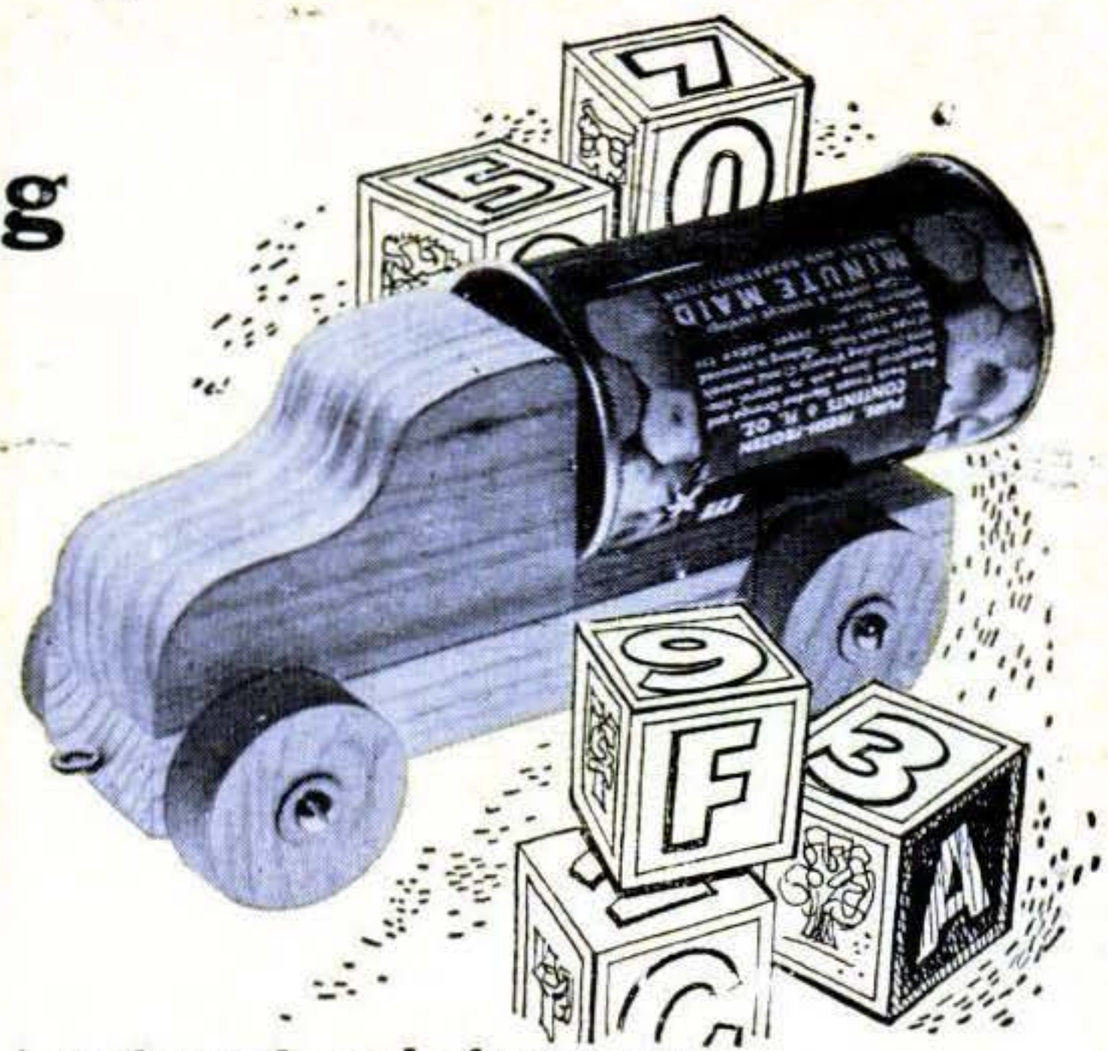
Have You Tried Using a Fruit-Juice Can?

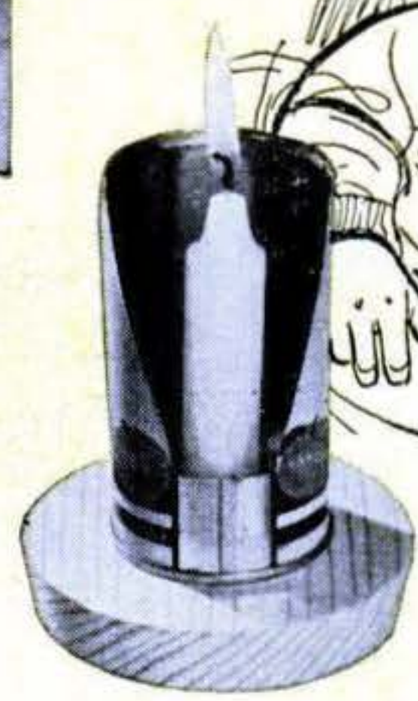
DON'T throw out frozen-fruit-juice cans. They're a handy size for craftwork projects and have many shop uses. They're just right for mixing or heating small batches of glue. Use them for molds to form fat, short candles from remelted candle ends. Cut them in half, lengthwise, add rubber-headed tacks for feet, and they make cigarette servers. Open a can at both ends, rest it on its side in a wire cradle, and it's a safe soldering-iron stand. Several other uses are illustrated. You can work out many more.



A tank truck made from a can and a few odd scraps of wood.

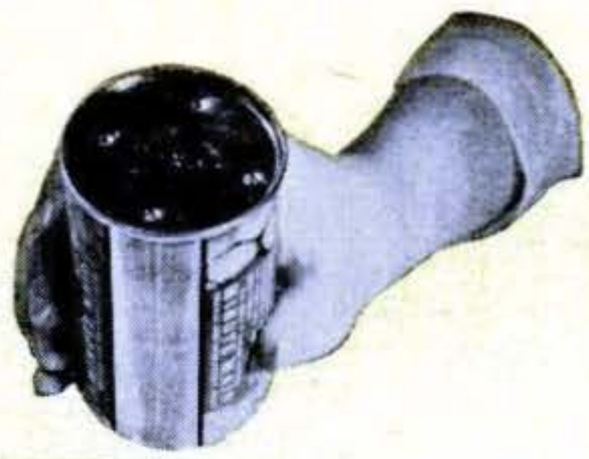
Tube shield is can with three lugs soldered on at open end.

Electric night light has cap and flame of glowing Lucite.

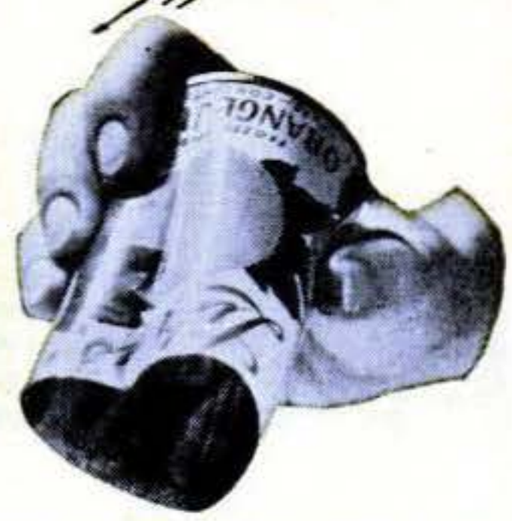


Simple candleholder shields the candle's flame from drafts.

Scoop is made by snipping out tin and add ng handle.



Biscuits or cookies are cut out in a hurry with a juice can.



A heart-shaped cutter is easily bent to shape with pliers.

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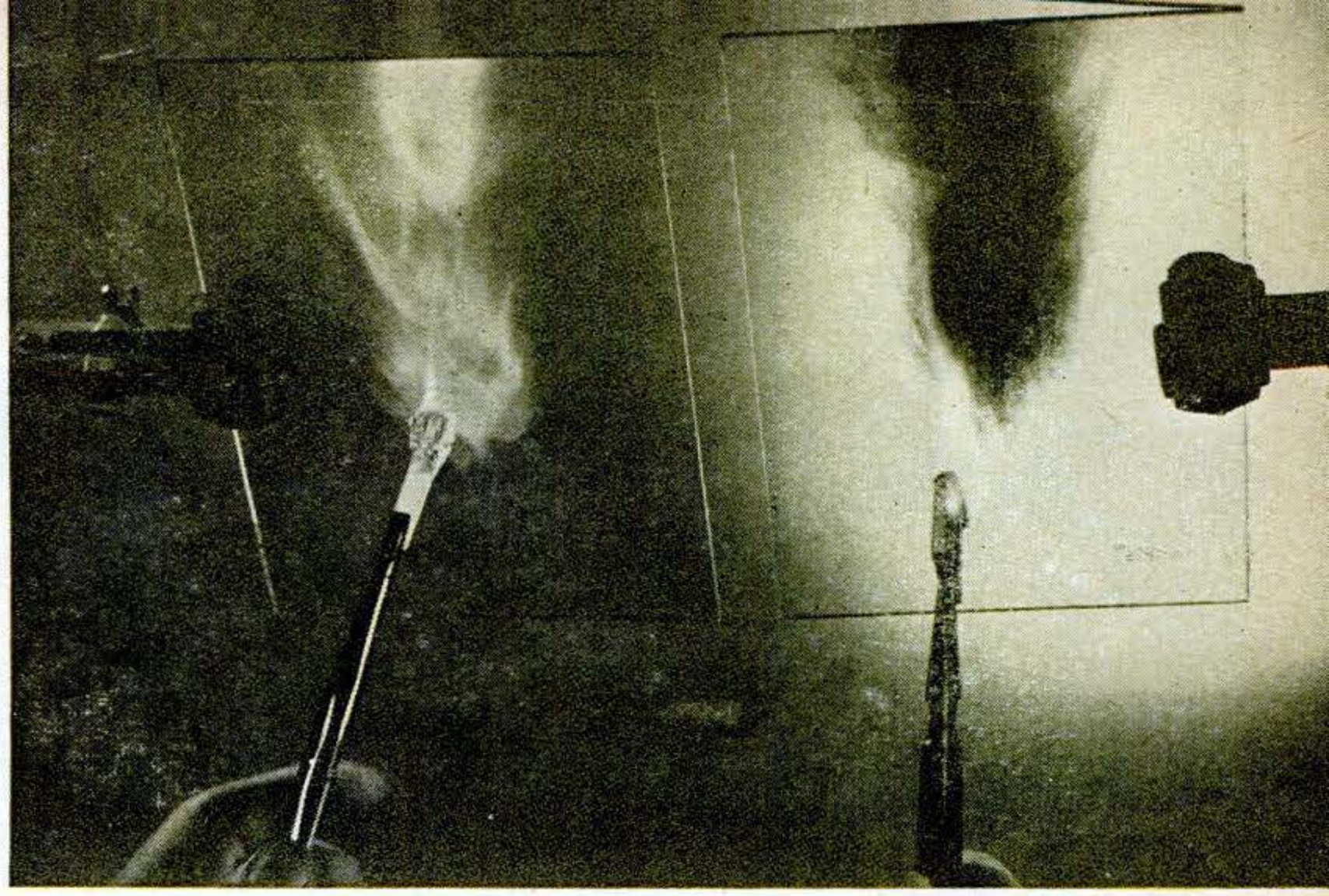


Back to sand they go. To see the basic difference between silicones and their organic counterparts, burn a bit of silicone rubber (silicone stopcock grease will do) and a bit of ordinary rubber, catching smoke from each on a sheet of cold glass. From ordinary rubber (far right) you'll get the familiar black soot of carbon, from the other a white vapor of silicon oxide —finely divided white sand.

SILICONES in Your Home

These strange substances have come from the laboratory to win themselves a special place in the everyday world.

By Kenneth M. Swezey

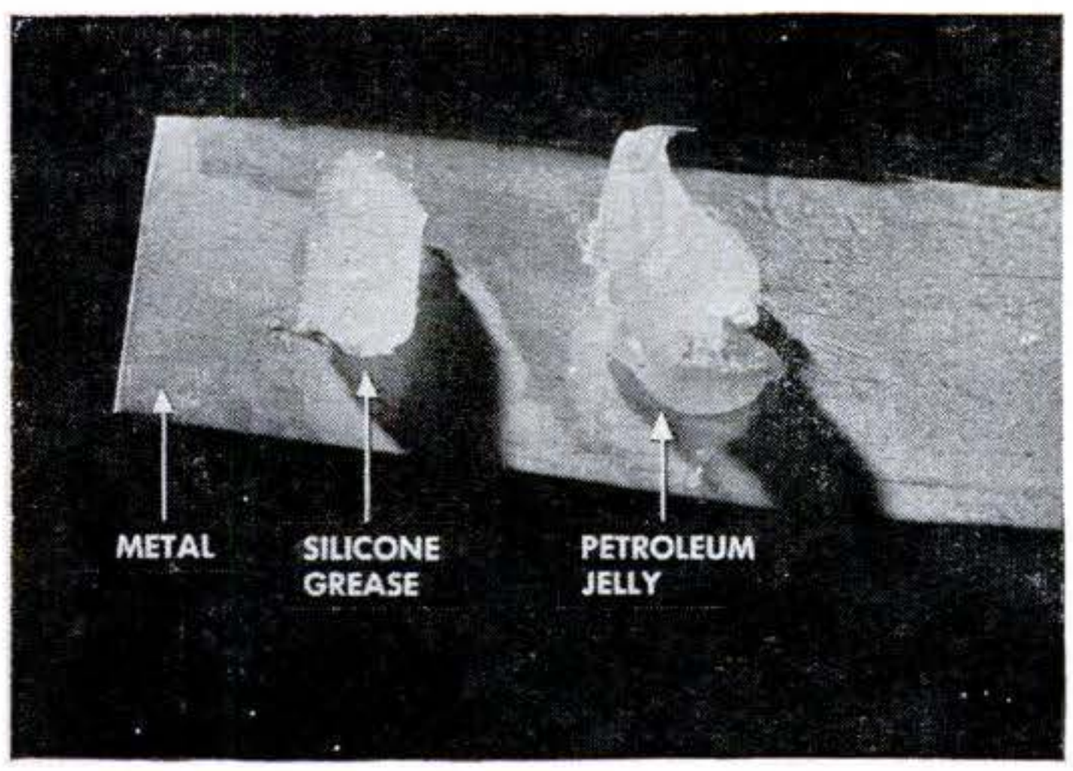
UNTIL a couple of years ago, silicones were known chiefly by reputation. But today you meet these amazing sand-derived compounds in dozens of useful products.

You can polish your furniture or wax your car with them, make fishing flies float better, lick electrical leakage on outdoor insulators, and treat cooking pots and pans so food won't stick—to name just a few of the many ways in which they are being used today.

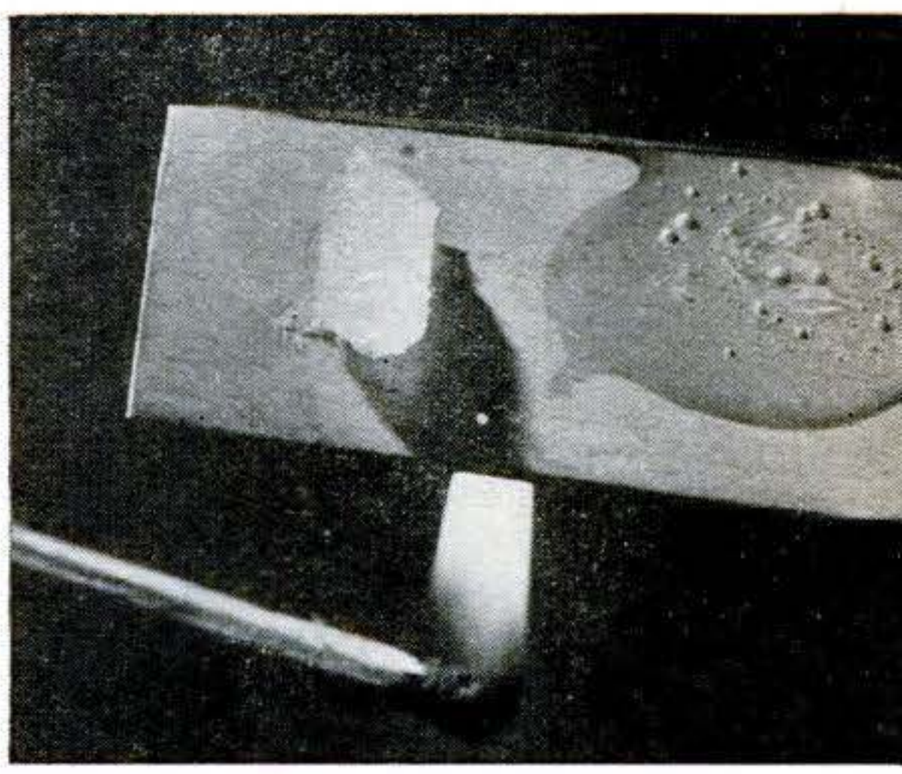
The ability to repel water is one outstanding trait of silicones. Another is the ability to withstand extreme heat or cold that would break down or freeze comparable organic materials. This property results from their backbone of sand, or silica, the word from which their name comes.

Outwardly, the silicones look for all the world like familiar oils, greases, resins and rubber compounds. But the accompanying experiments will show you remarkable differences.

To perform them you need such silicone materials as Dri-Glo furniture polish, Pantastic utensil coating, Dow-Corning stopcock grease and bouncing putty. You can get the grease from chemical supply houses, the putty from novelty shops, and the polish, wax and pan coating from many department stores.



Heat or cold will not affect silicone oils and greases. Their backbone of heat-stable silicon oxide makes them useful under conditions where ordinary oils and greases would freeze, leak out or burn. Silicone stopcock grease, for example, won't harden at minus 40° and won't melt at 400° F. As test at right shows, a match readily melts ordinary greasing jelly.



To see what silicones can do, please turn the page.

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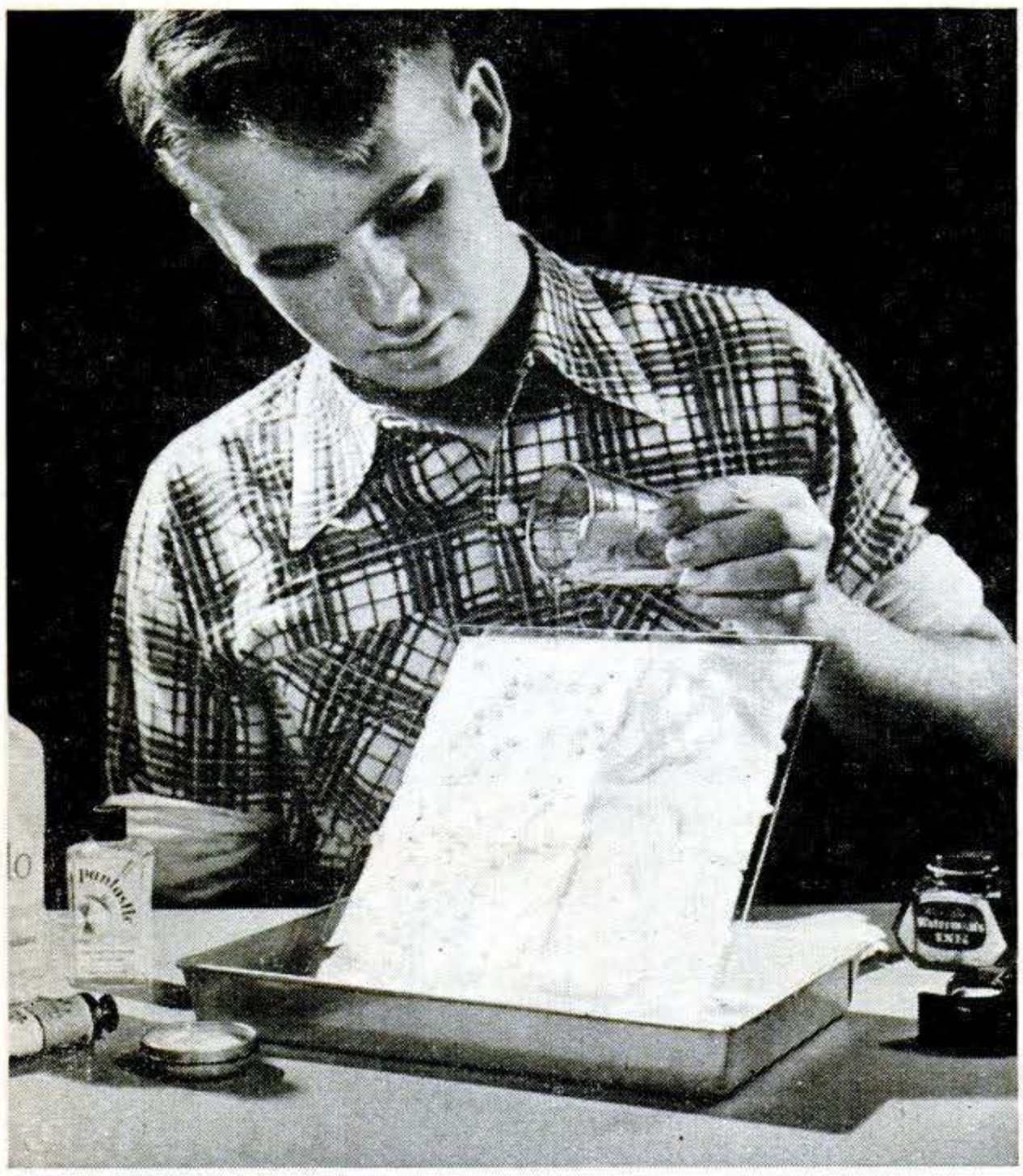
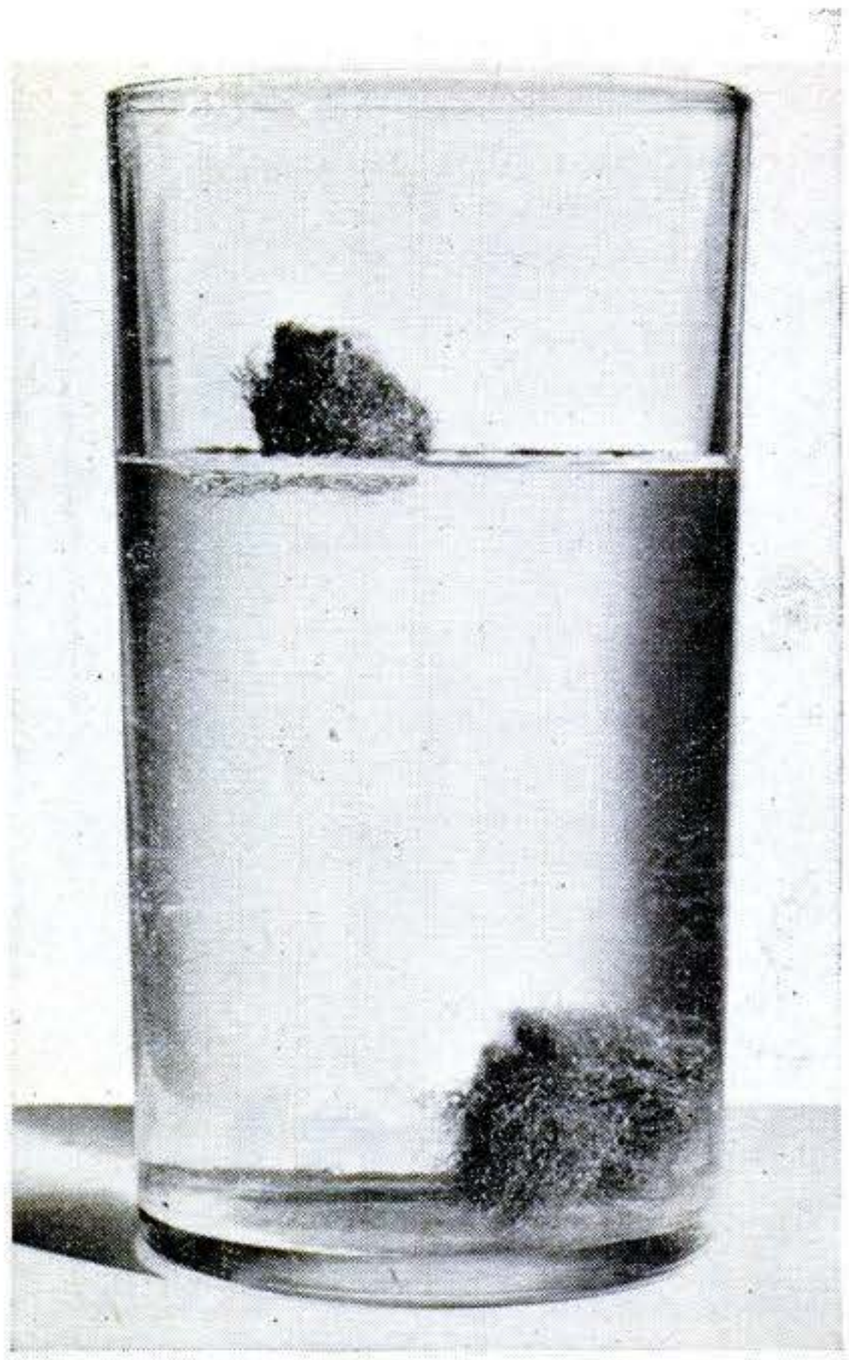
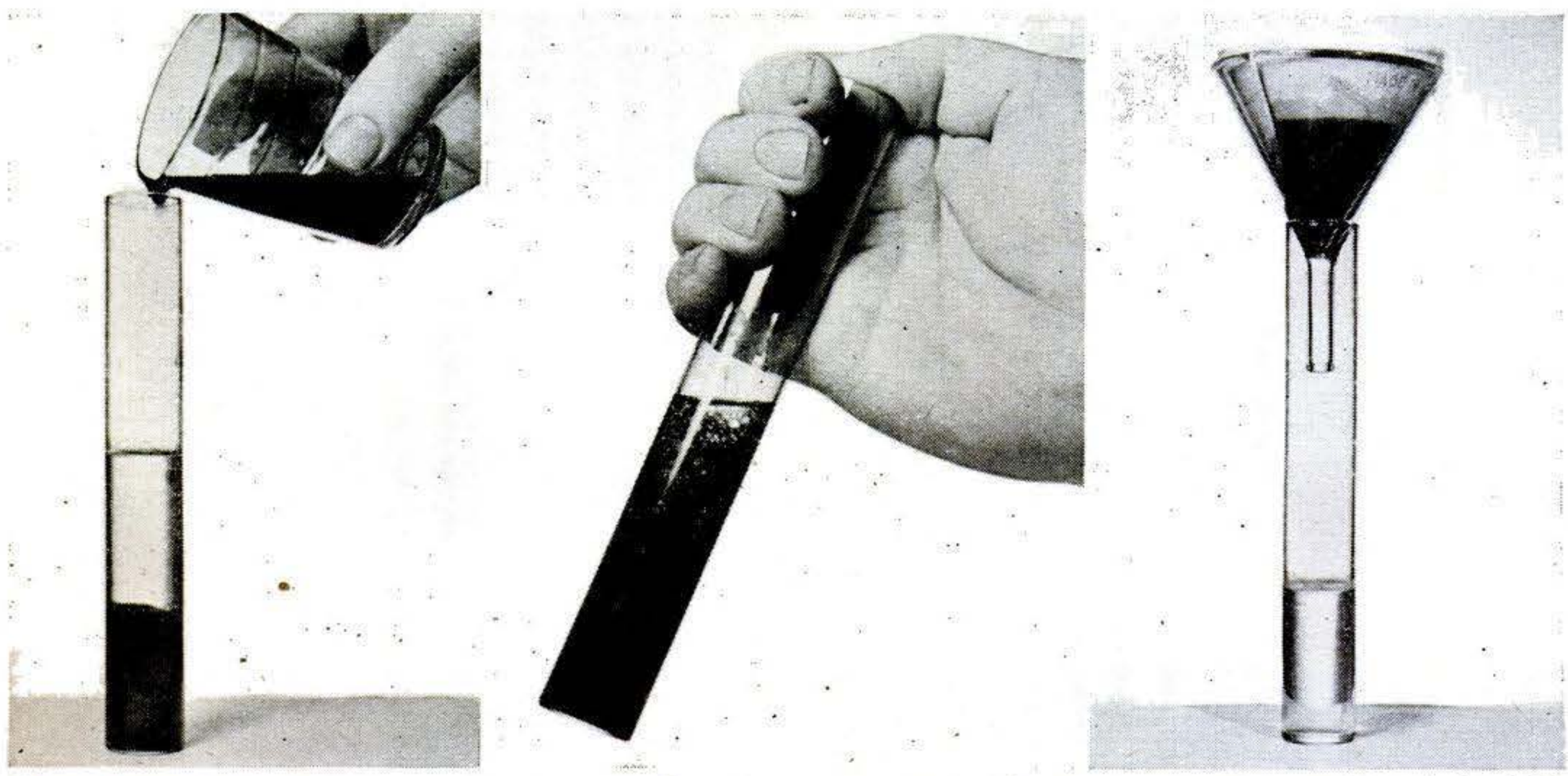


Silicones repel water. You can prove this for yourself. Apply silicone furniture polish to a cloth, and rub the cloth over half a paper-towel resting on a sheet of glass. Then pour water over the towel as above. The water will roll off the silicone surface but will wet the other half completely. This quality adds to effectiveness of car and furniture polishes and is also used to make clothing showerproof.



They make metal float. How fishing flies stay up when treated with silicone oil can be shown with this steel-wool stunt. Saturate a small wad of clean steel wool with Pantastic and squeeze out the excess. When dry, dunk this and an untreated wad in water. Treated wad will float, the other will go to the bottom. See page 224 for other uses of Pantastic.



How they affect clothing. A coat treated with silicone water-repellent sheds water but lets air and water vapor through the cloth. That's why it is more comfortable than a waterproof coat, made of plastic or rubber, that traps perspiration by preventing air circulation. To see how a material can shed water and still be porous to other liquids, cut a disk from a paper towel, give each side two coats of Dri-Glo polish, fold into quarters and put into a funnel. Pour equal parts of benzine and ink-colored water into a bottle (left). Shake thoroughly (center) and pour mixture through paper-towel filter into another bottle. Clear benzine will trickle through, but colored water will be left behind in filter (right).

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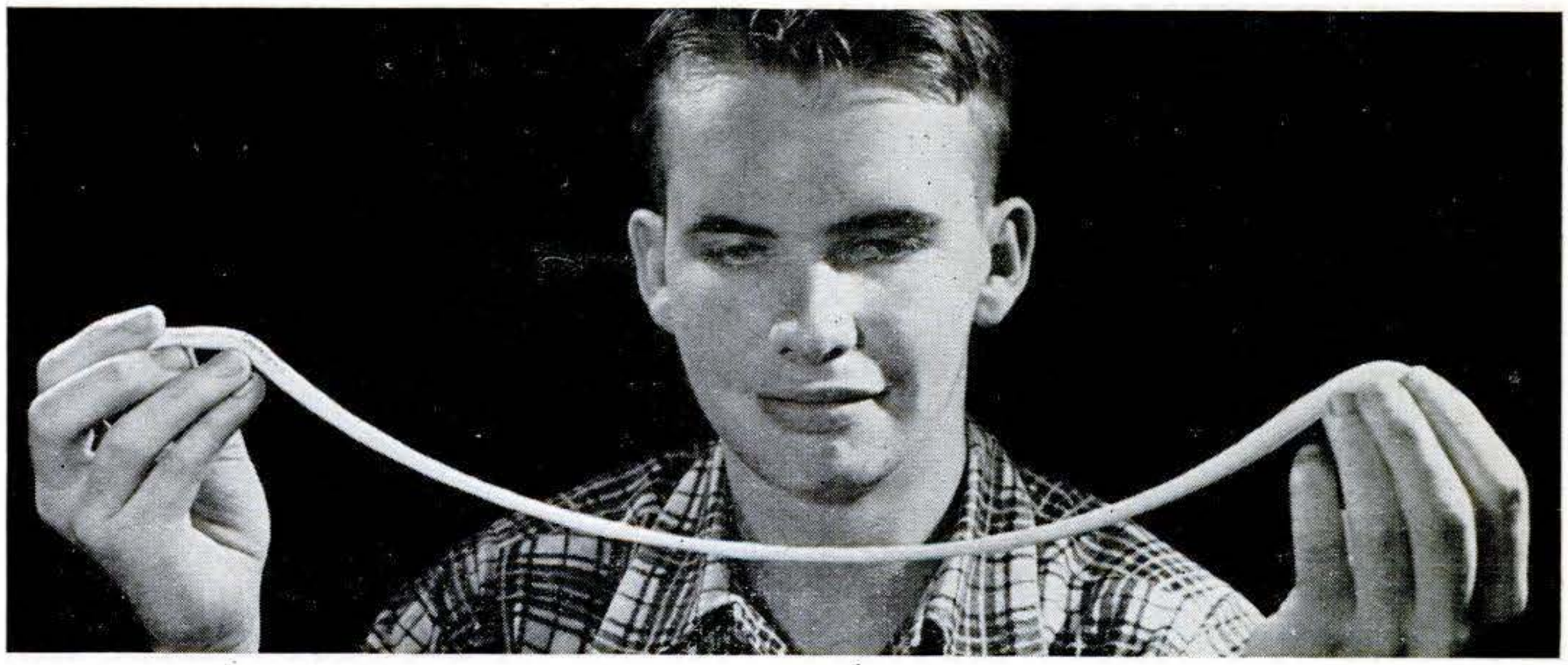
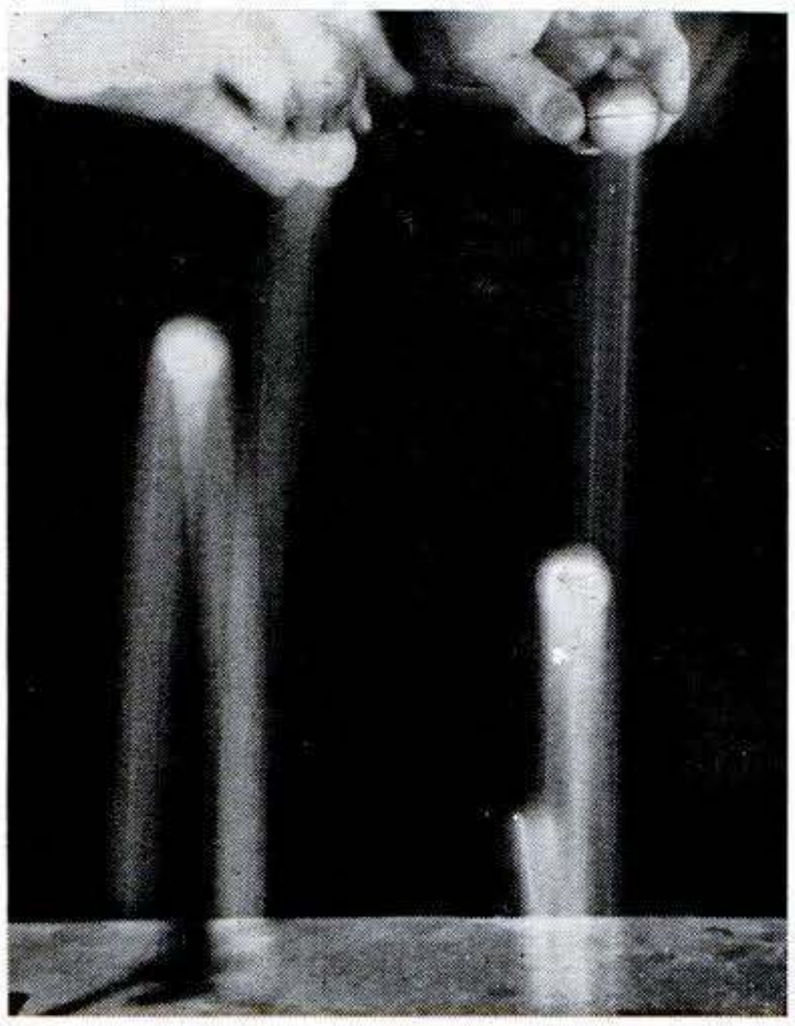
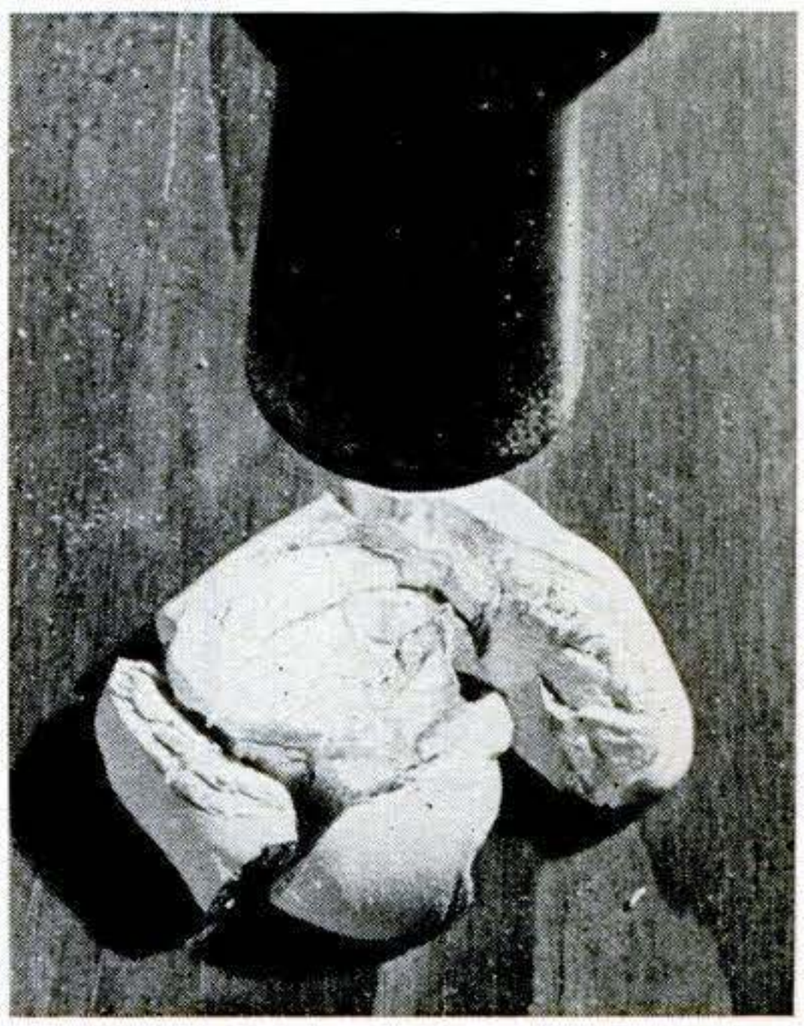


Bouncing putty is one of strangest silicones. Pull a wad slowly and it will stretch like taffy.



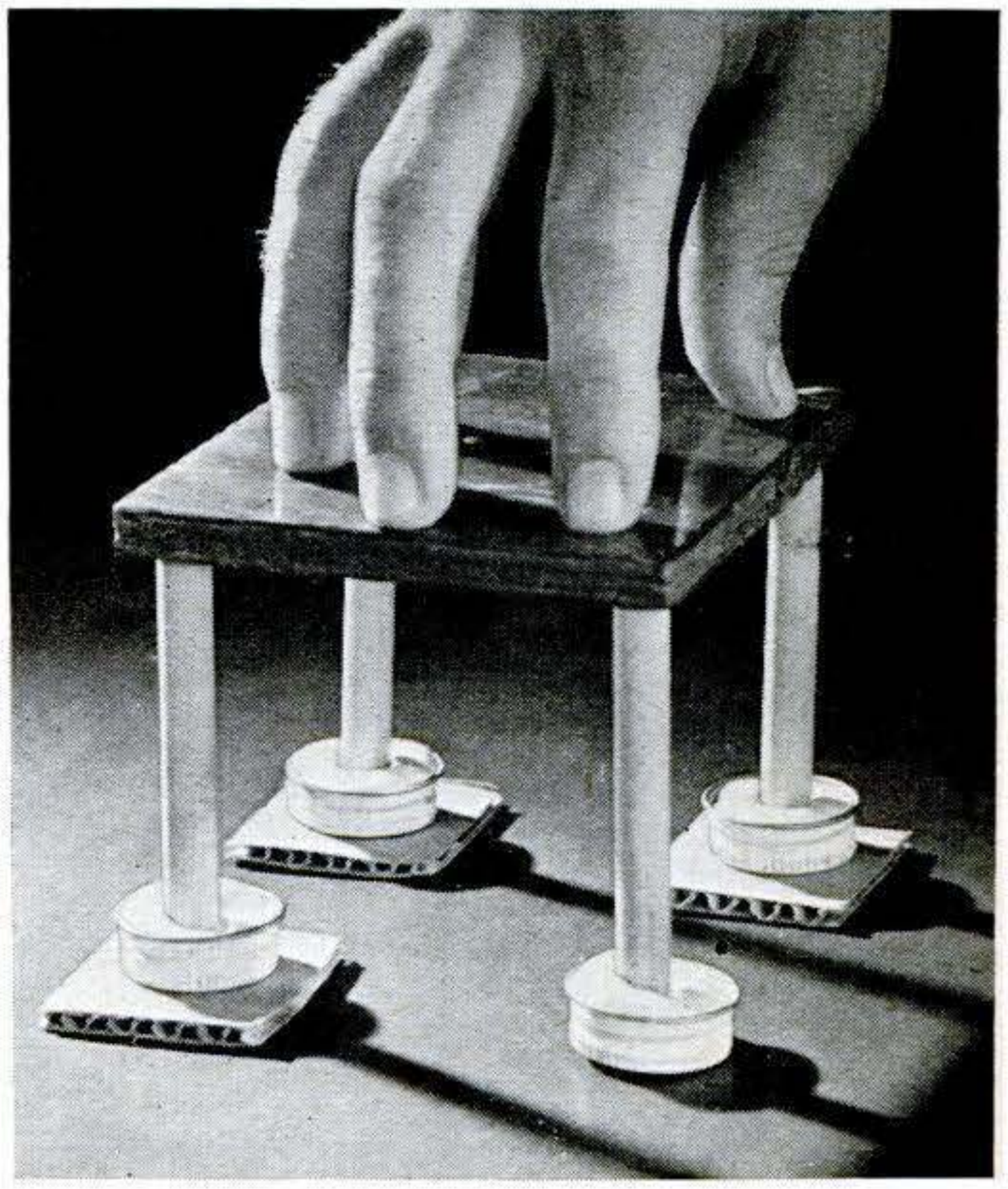
Mold putty into ball and drop it and ordinary rubber ball from same height. As these patterns show, the putty (far left) will bounce higher and faster than the rubber ball.

But smack putty with a hammer while it is on hard surface (right) and it shatters like glass.



How bouncing putty is used. You'll find it in devices made to stop furniture from wobbling on uneven floors (see page 142). You can show how these work by setting the legs of a toy table in bottle tops containing bits of bouncing putty. With cardboard, raise three legs higher than the fourth. Then press down on table top to try to wobble it. Steady pressure on a corner tilts table but it won't wobble. The putty acts as a slow-motion hydraulic fluid, flowing out from under one leg and rising under opposite one as the pressure is changed. Bouncing putty also makes core of some golf balls.

Bouncing putty's secret. This freak silicone actually is a slow-moving liquid. Put a ball of it on a shelf and the ball eventually will flatten. Pulled slowly, the material flows with your pull. But if you pull it quickly, throw it on the floor or hit it with a hammer, it snaps, rebounds or shatters, for its molecules have a speed limit beyond which they can't flow past each other.



Please turn the page for more on silicones.

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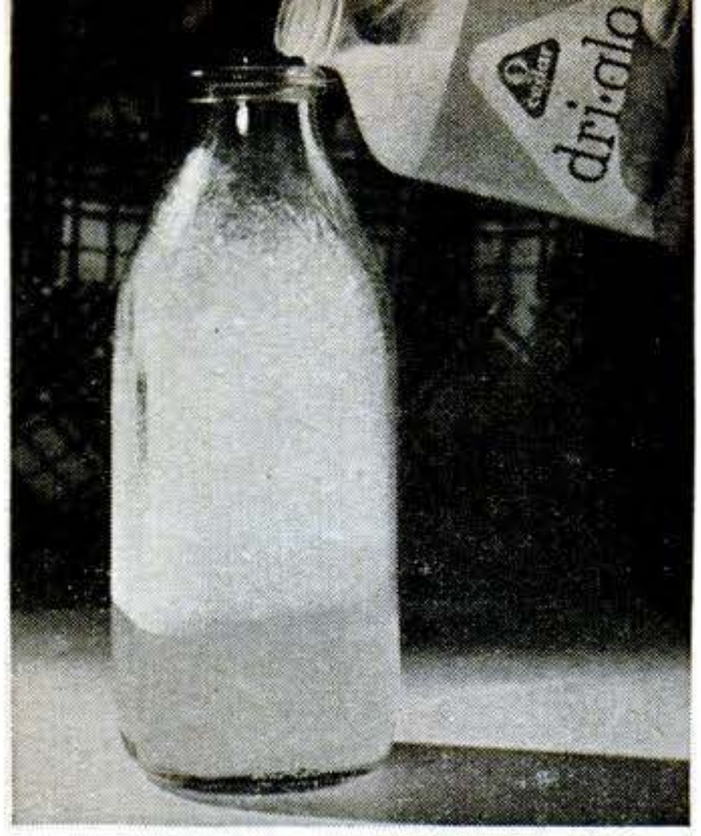
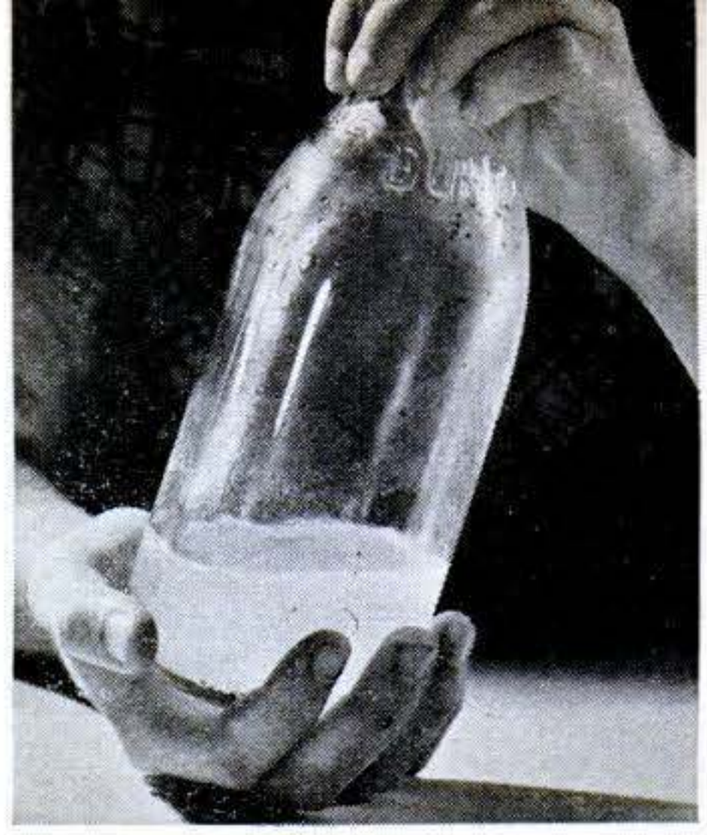


Foam prevention is important use of certain silicone fluids. Excessive foaming may mean an inferior product or waste in making rubber latex, in preparing wines and jams, in circulating oils and in other industrial operations. Certain silicones will stop the foaming. You can see this by adding a drop of Dri-Glo to a bottle containing soapy water topped by suds (left). Shake bottle and foam will vanish (right). It cannot be formed again.

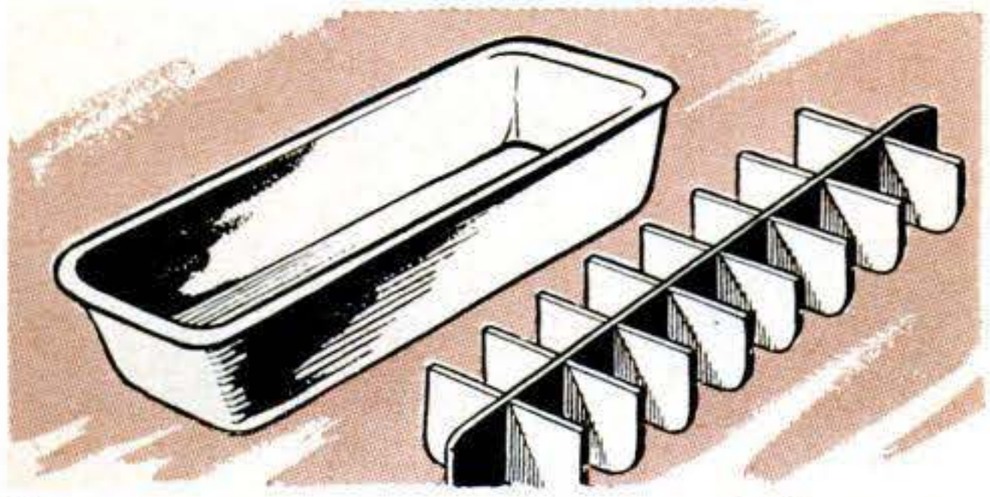


How You Can Put Silicones to Work

Pan-coating compound has other uses, too. Just wipe it on with a cloth. It dries quickly, will not affect taste of food.

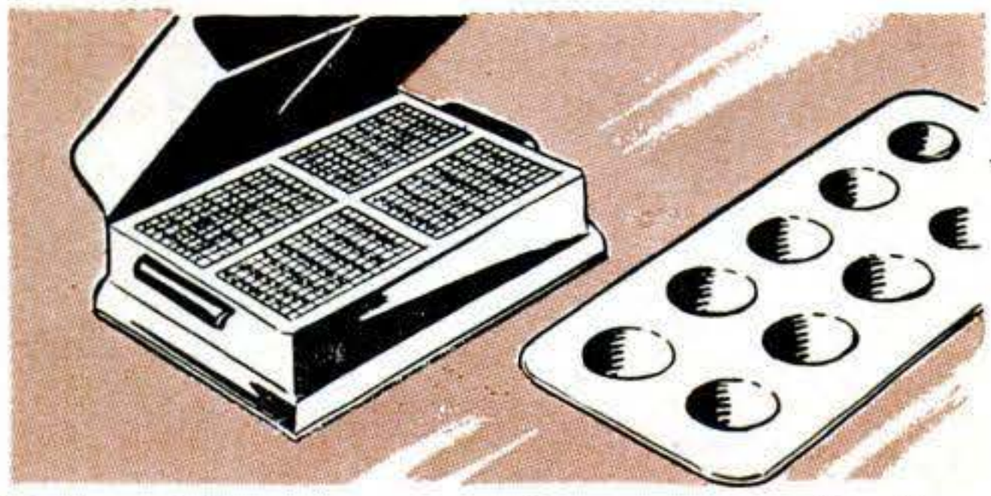
Keep food from sticking. After compound has been applied to metal or glass pots and pans, a soak, a wipe or a rinse will clear away remaining food. Application may last for as many as 60 uses if pot is not scoured.

Prevent electrical leakage. Spread on insulators used with outdoor antennas for radio or television sets, silicone compound will cause water to break up into separate globules, thus preventing electrical loss.

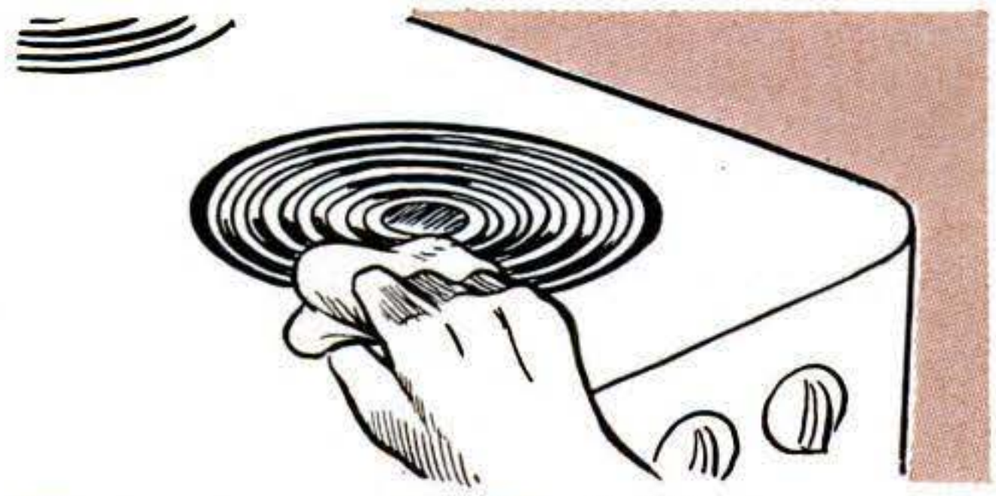


Keep ice trays loose. Trays won't freeze to freezing compartment, and cubes will break away from tray with little trouble.

Iron more easily. If the compound is applied to the bottom of your iron, the iron won't stick to starched fabrics.



Bake without grease. You can usually forget about the grease for baking tins and waffle grids. However, grease still is needed in baking anything that has much free sugar.



Clean a stove easier. Food drippings can be cleaned from range burners and oven broilers as easily as from china or glass after being protected with silicone compound.

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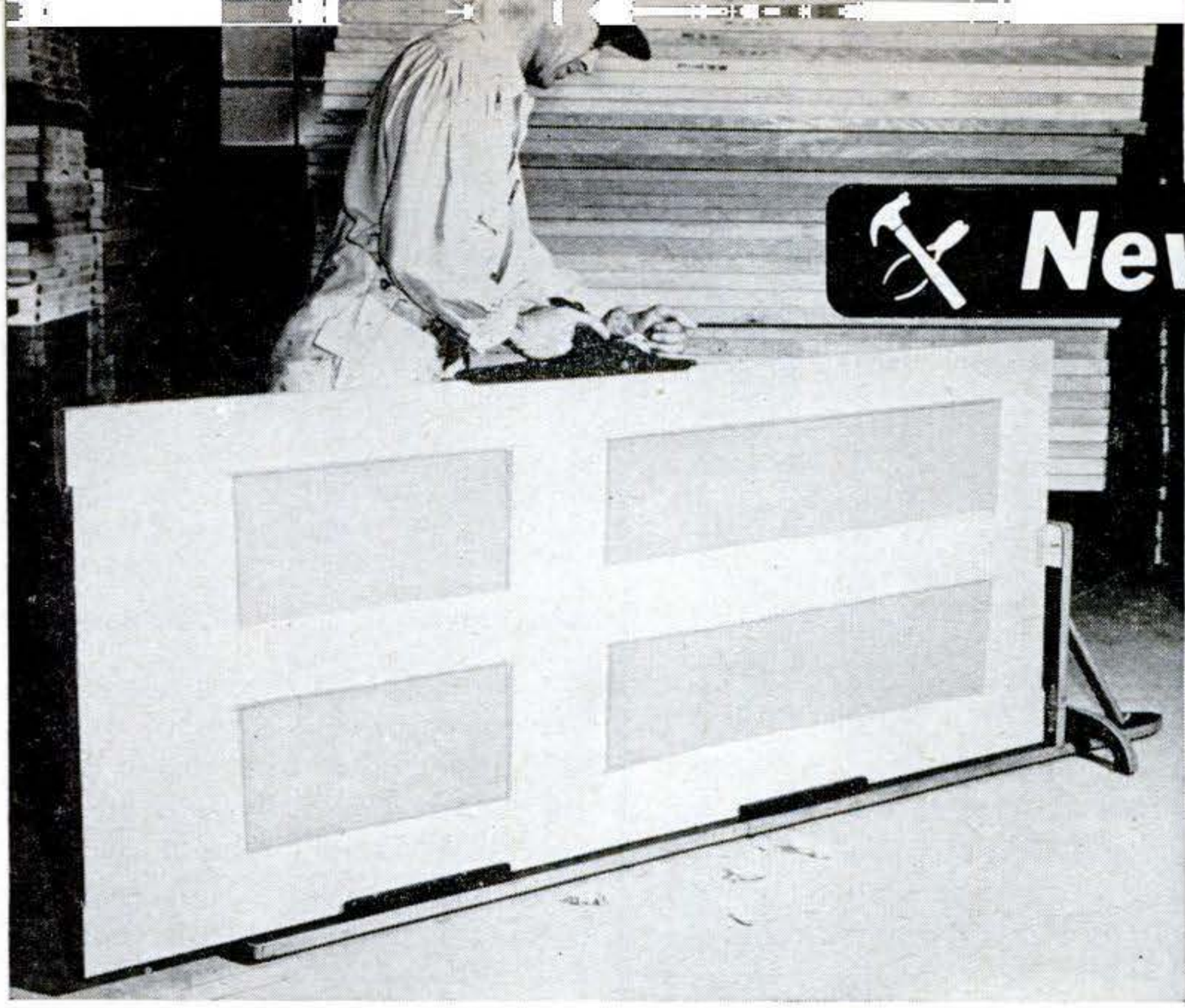
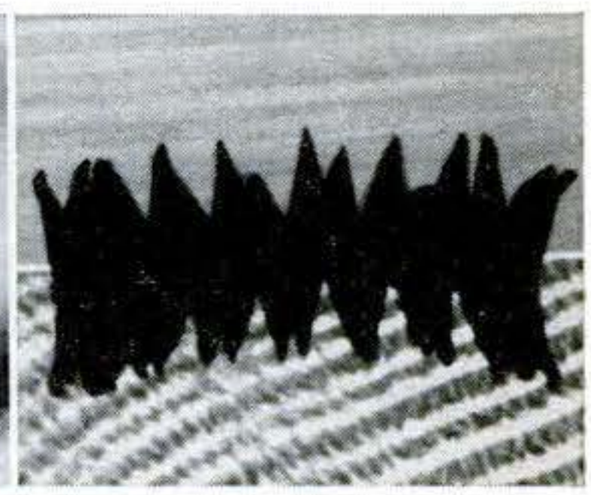
New Tools

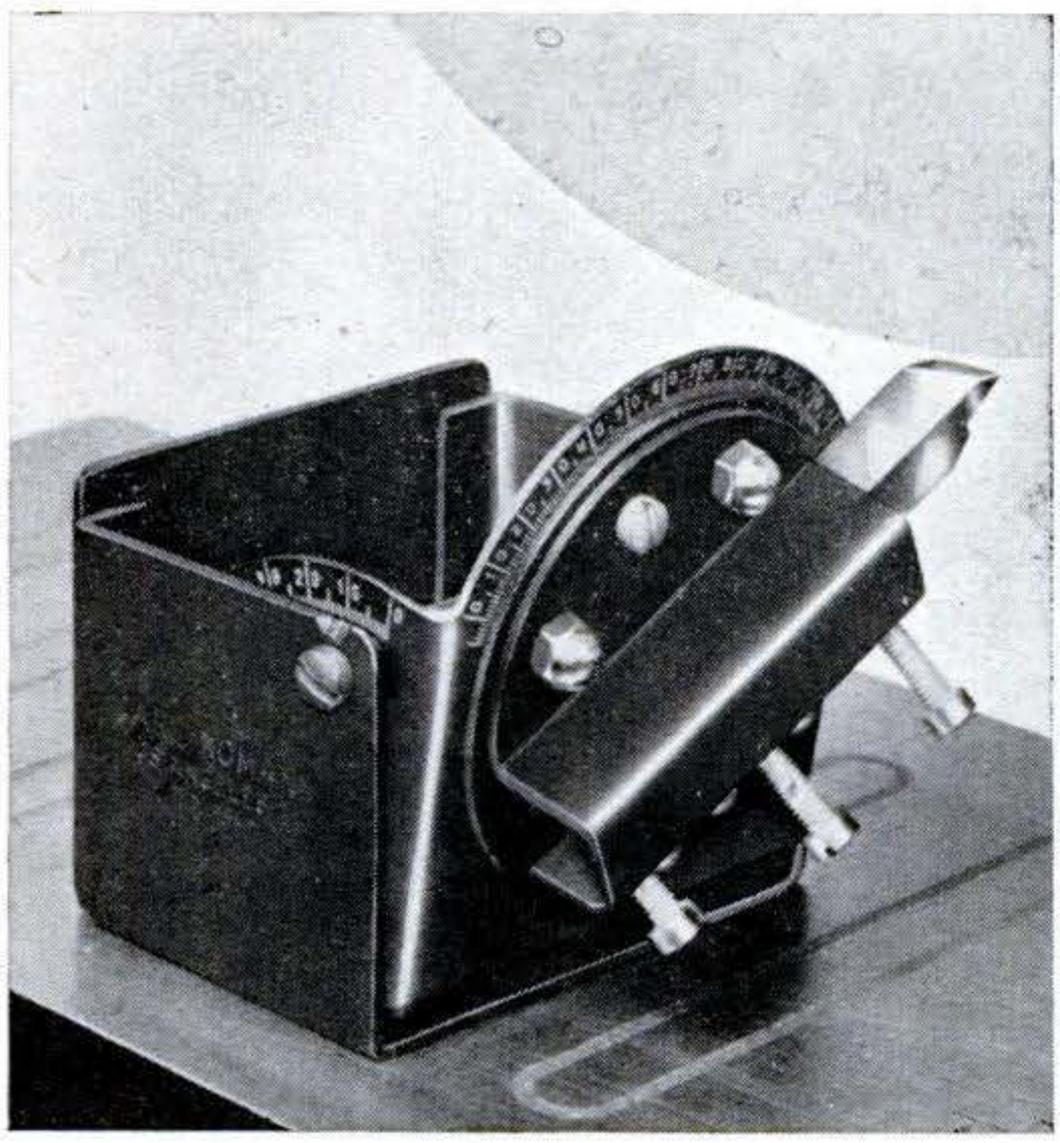


Door Jack Folds. Although this tool for supporting doors measures 7½′ in length when fully extended, it can be folded to about half that for carrying. Pulling a pin disconnects the jack at the center The upright measures 18″. *E-Z Mark Tool Co., Los Angeles.*

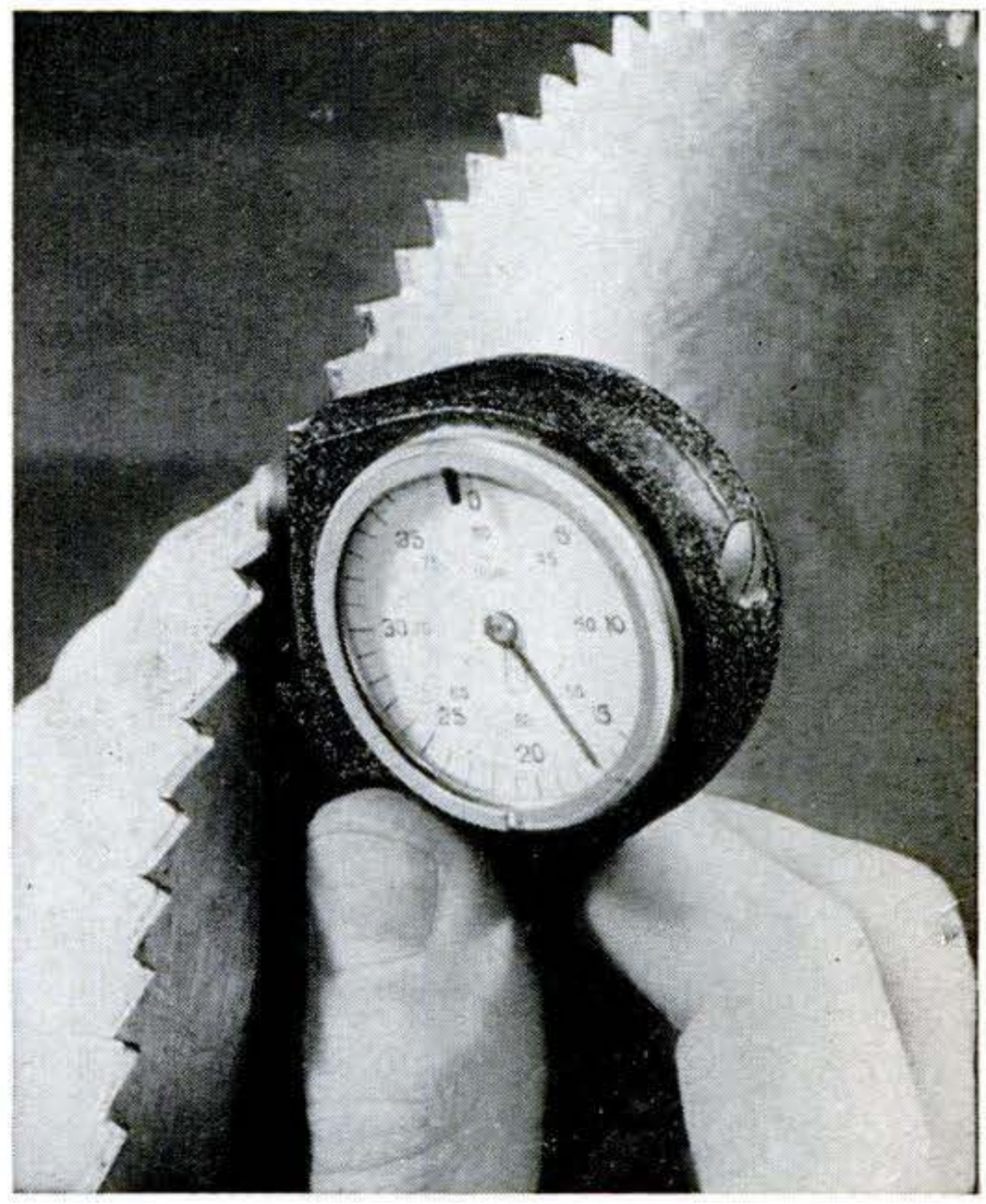
Fastener Joins Wood. Even if one part is hardwood and the other softwood, this toothed band joins them securely Photo at right shows how fastener looks to the naked eye; at far right is an X-ray view of it embedded in two pieces of wood. It is made in three sizes. *Metal Industries, Inc., Burr-Lock Division, Youngstown, Ohio*



Grinds Tool Angles. Tool bits up to ½″ in section can be accurately ground to any angle with this holder Three setscrews hold the tool in place in a slot while the dials show the angle it is set at in two planes. It can be used with a magnetic table. *Carl Nomann Co., Los Angeles.*



Gauge Checks Set of Saw Teeth. The tooth set of any circular-saw blade can be read to within 001″ with this gauge. *PTI, Inc., New York City.*



Please turn the page for more new tools.

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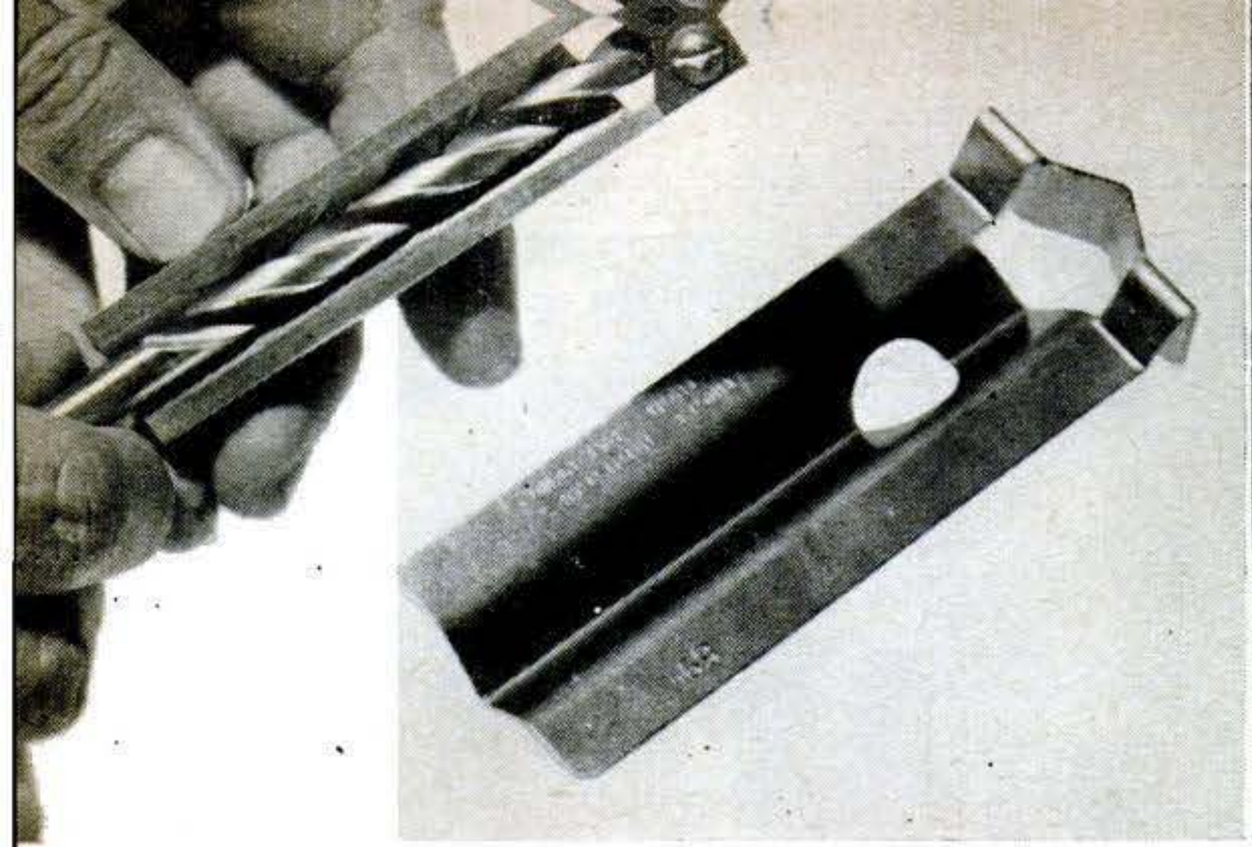
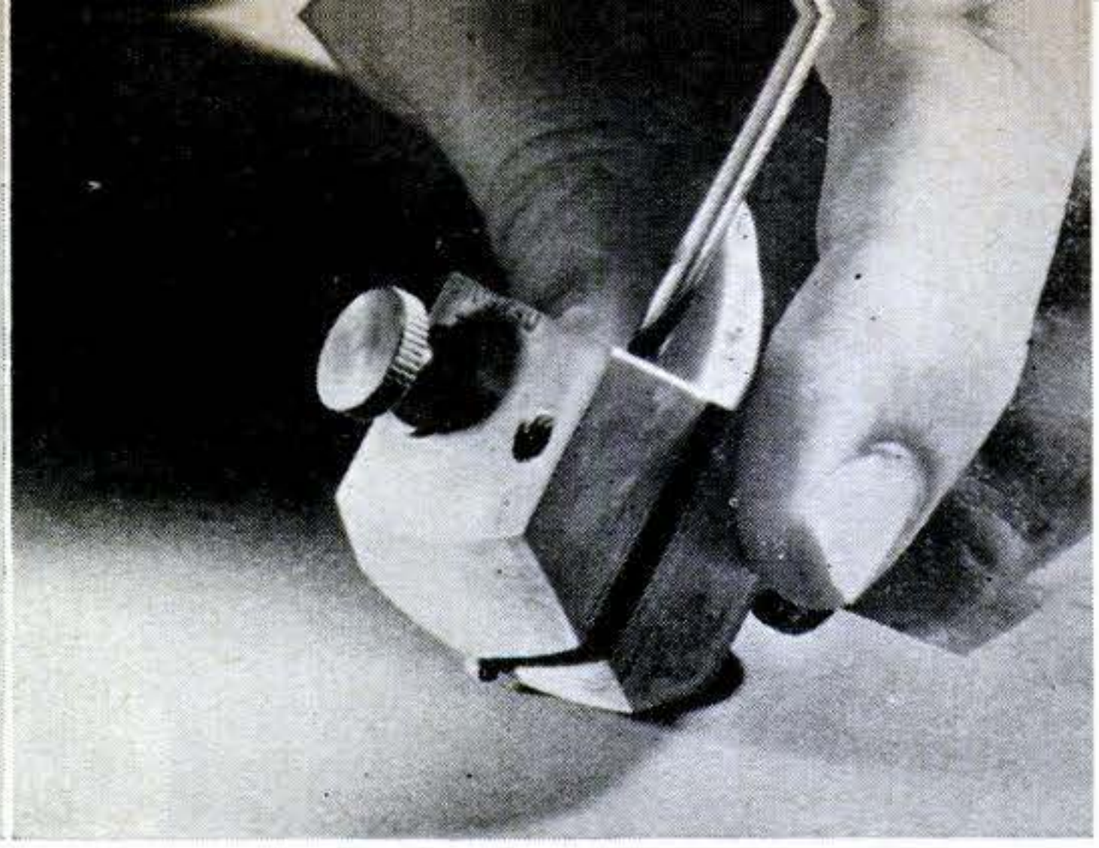
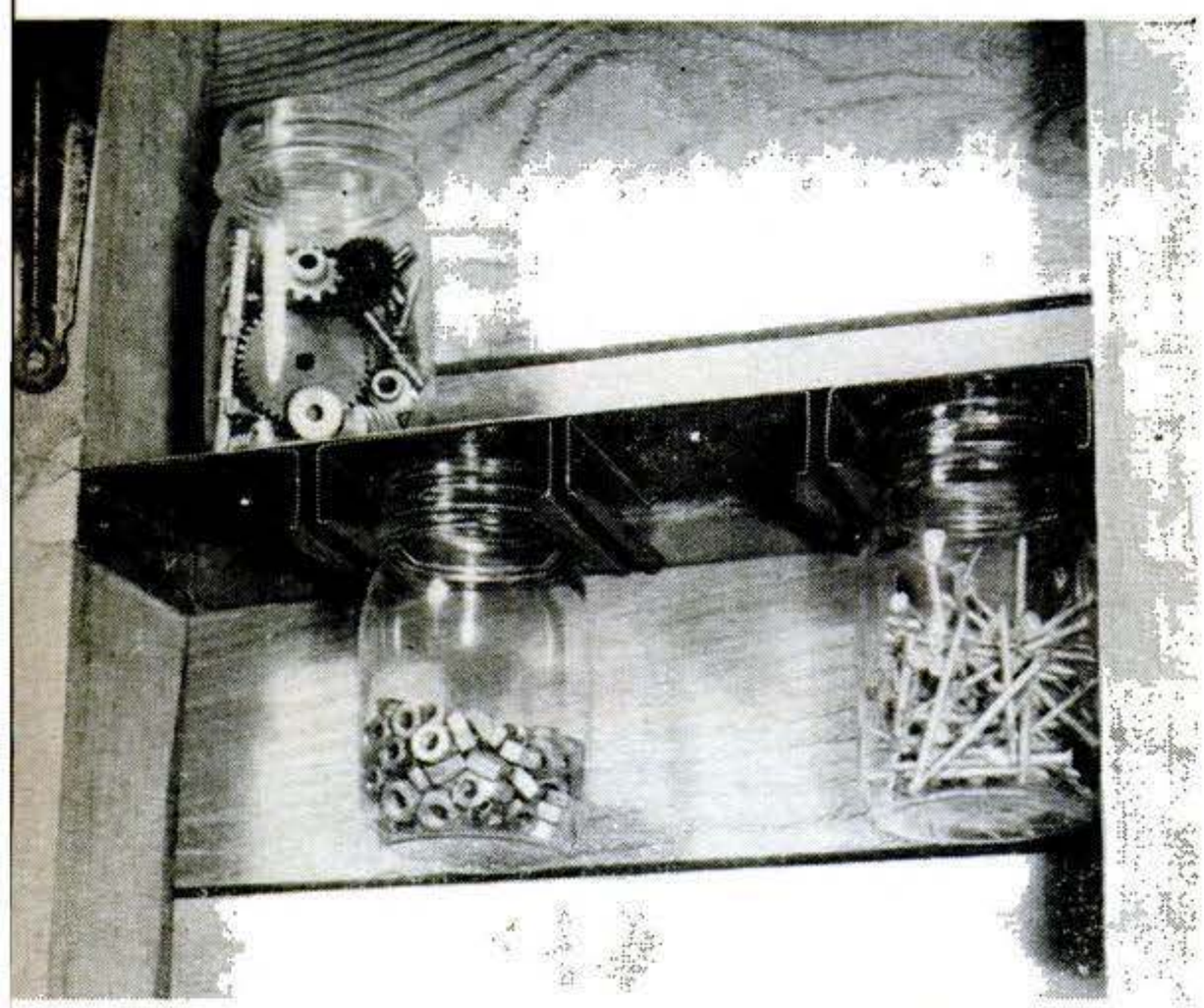
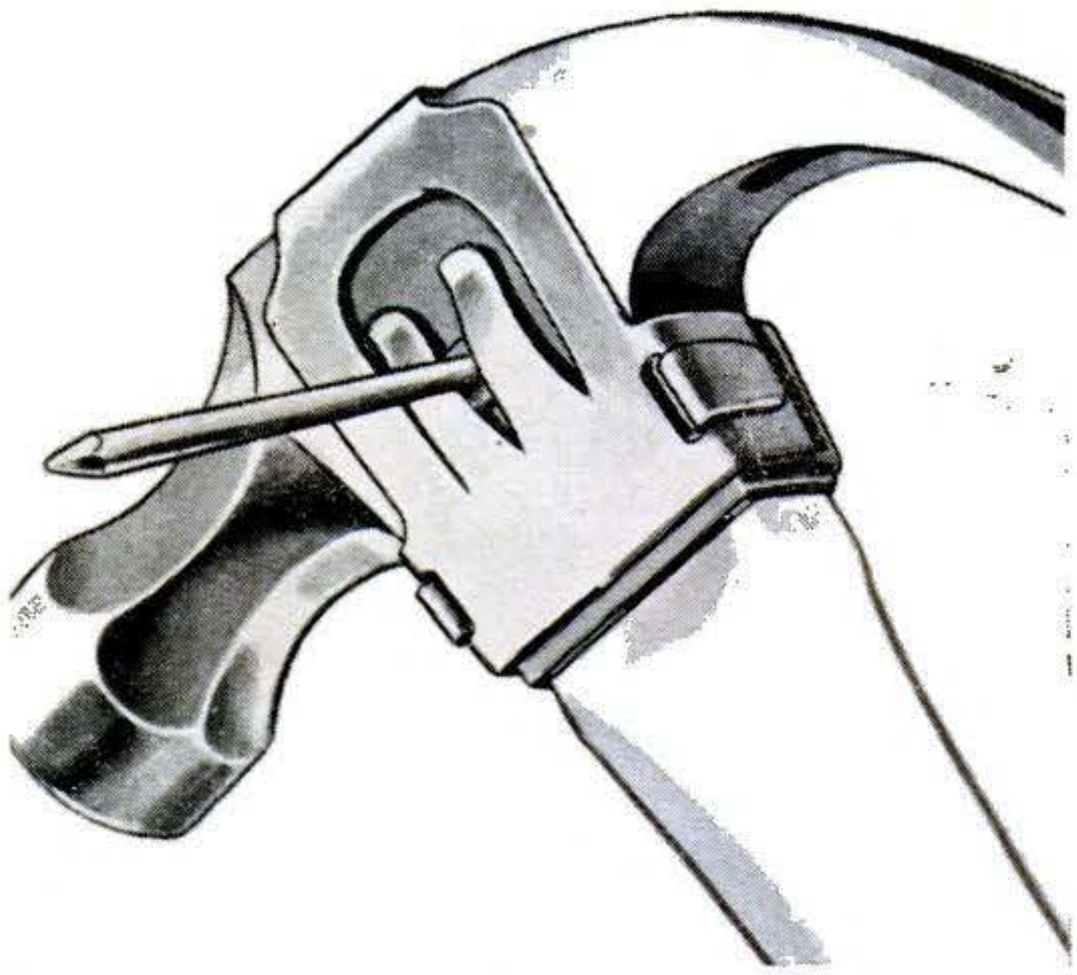




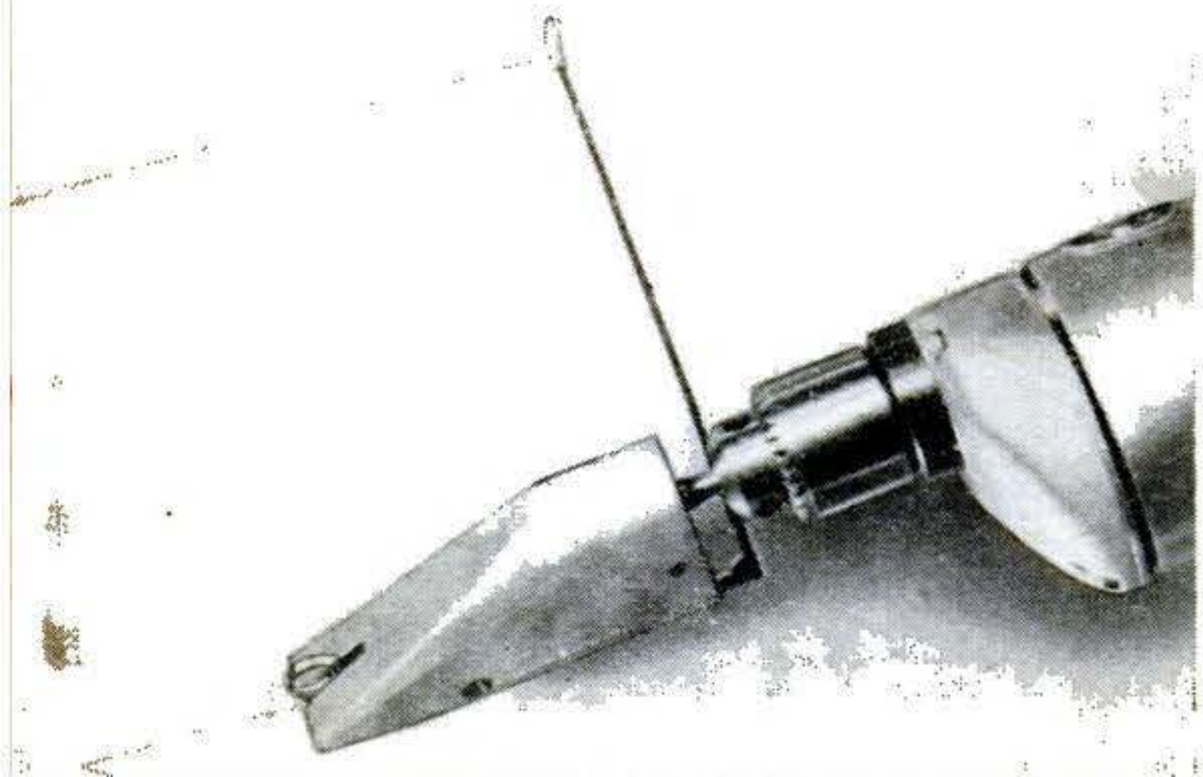
Sharpening Aids for Small Drills. The tough job of accurately sharpening small drills is made easier by these three gadgets. With each of the two gauges at left, above, you can check point angles and clearances of drills. The one shown in use is made of steel and takes drills from 3/32″ to ¾″. The gauge block is removable so other blocks with different drill-point angles can be substituted. The other gauge is half-hard aluminum and takes drills from ⅛″ to ¾″. It is set for the standard 59° angle. The curved bevels of the sharpener pictured at right hold the drill at the correct angle as you pass it over an oilstone. The tool is designed to put the standard 59° cutting edge on drills. It takes drills from No. 30 to No. 70. *Tingle Industries, Detroit.*



Jars Hang from Workshop Shelf. Brackets underneath this metal shelf hold four pint Mason jars for storing nails or small parts. It is designed to be mounted on a wall or between studs that are 16″ on centers. *Colper Sales Co., Wichita, Kan.*



Nail Clip Acts as Third Hand. With this clip on your hammer you can start nails in spots that you couldn't otherwise reach. It provides prongs for holding nails on both sides of the hammer. *Amsco Company, Le Center, Minn.*



Drill Drives Cutter. Designed to be chucked in a ¼″ electric drill, this cutter for sheet metal, plastics or linoleum is made in two models—one for materials up to .040″ thick and the other for work .055″ thick. You don't need to work in from an edge; if you drill or punch a small hole for the blade, you can start cutting inside a sheet. *M-M-A, Inc., Lancaster, Pa.*

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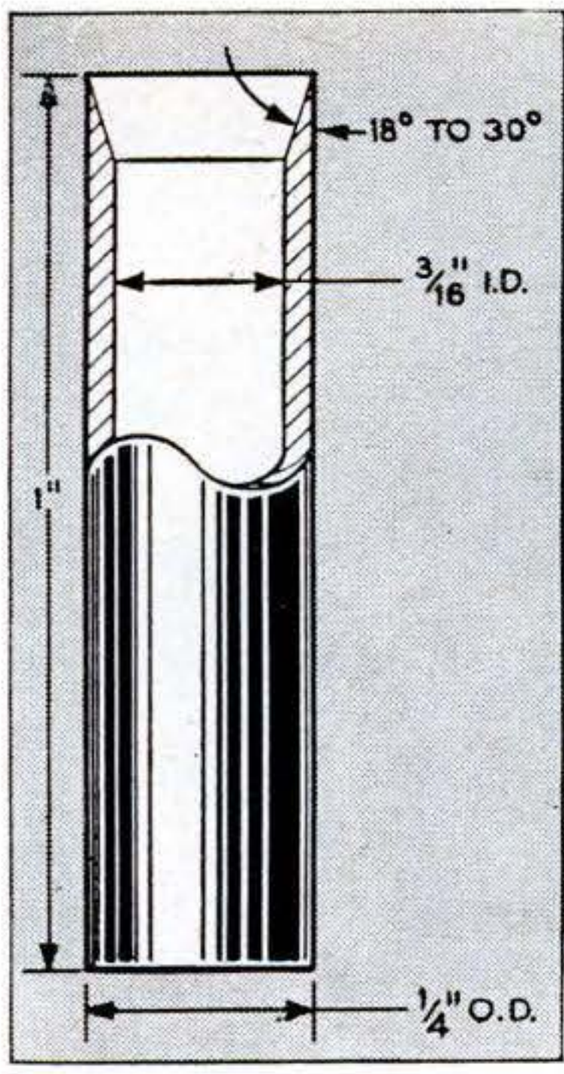


A sheet of molded phenolic plastic being turned on the faceplate with a tubular tool ground as shown in the drawing at left.

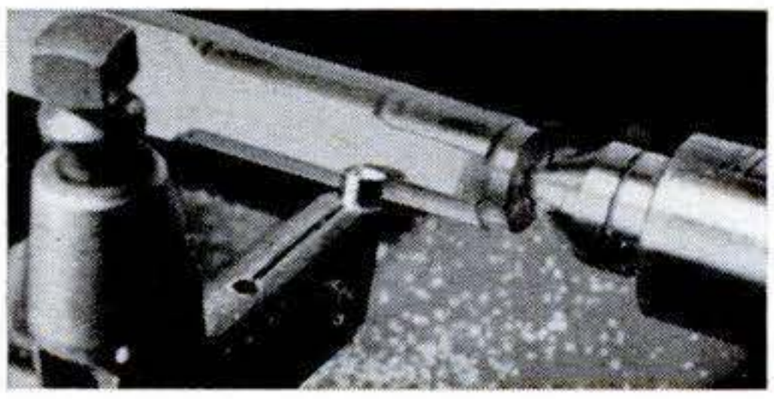
Sharp-Edged Tube Turns Materials to a Smooth Finish

Wood and plastic can be turned and finished in one lathe operation with an easily made tubular tool. Described in a paper by Prof. E. George Stern, Director of the Wood Research Laboratory, Virginia Polytechnic Institute, the tool is a 1″ length of ¼″ drill rod. This is drilled through 3/16″, and an internal taper is ground at one end with a tool-post grinder or a hand grinder on the cross slide, forming a sharp edge.

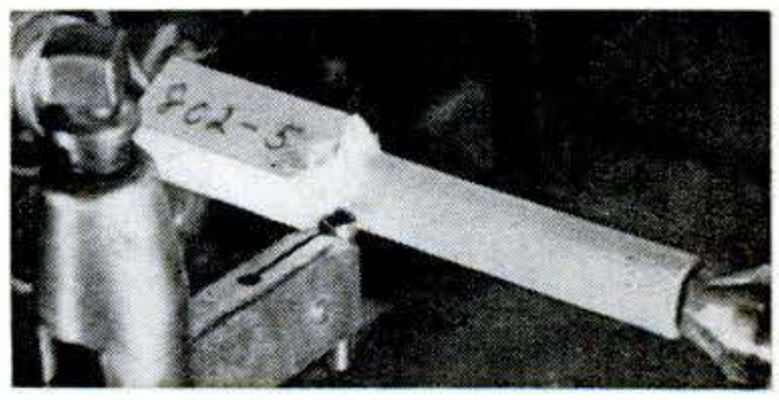
The tool is mounted either straight or at a rake angle in a piece of ⅜″ bar stock, slotted and fitted with a clamping screw. Thus it can be turned in its socket to present a new cutting edge without altering its setting. Sharpening is simply a matter of regrinding the taper. The tool will turn a true radius equal to its own and tangential to a straight-turned portion. Accurate radius cutters of any size can be made from rod of appropriate diameter.

The fineness of the finish is governed by speed and feed, but limited only by the texture of the material. Wood will show a different finish where it is turned across the grain, whereas plastic can be turned to a high gloss equal to that of a polished surface. Since no sanding or buffing is needed, the part retains lathe-turned accuracy.

Prof. Stern points out that cutting oil could be fed through the tool directly to the cutting edge, or a suction air line connected to the tubular tool to draw dust and shavings away through it.



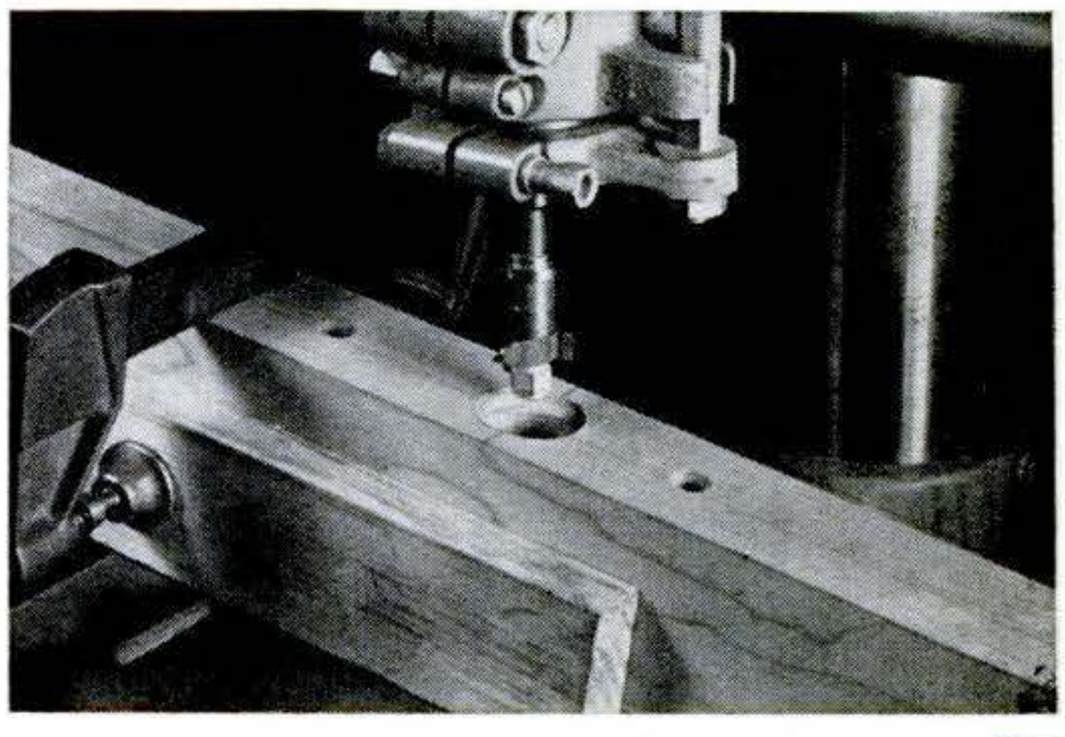
Tubular edge turns cellulose acetate (left) to a high gloss that requires neither sanding nor buffing. Yellow poplar (right) turns smooth, but shows difference in texture across grain.



Shaper Cutter Bores Holes

Recently I had to bore four holes at a precise angle in a table frame for the legs, but didn't have the 1¼″ machine bit needed. This simple dodge worked fine.

First I drilled the holes with a 1″ wood bit in the drill press. Then I used a wood-shaper cutter to bore the holes to size. To prevent burning the cutter, the drill press was run at the slowest speed. I turned the leg tenons to fit the holes.—*G. A. Wagner, Delmar, N. Y.*



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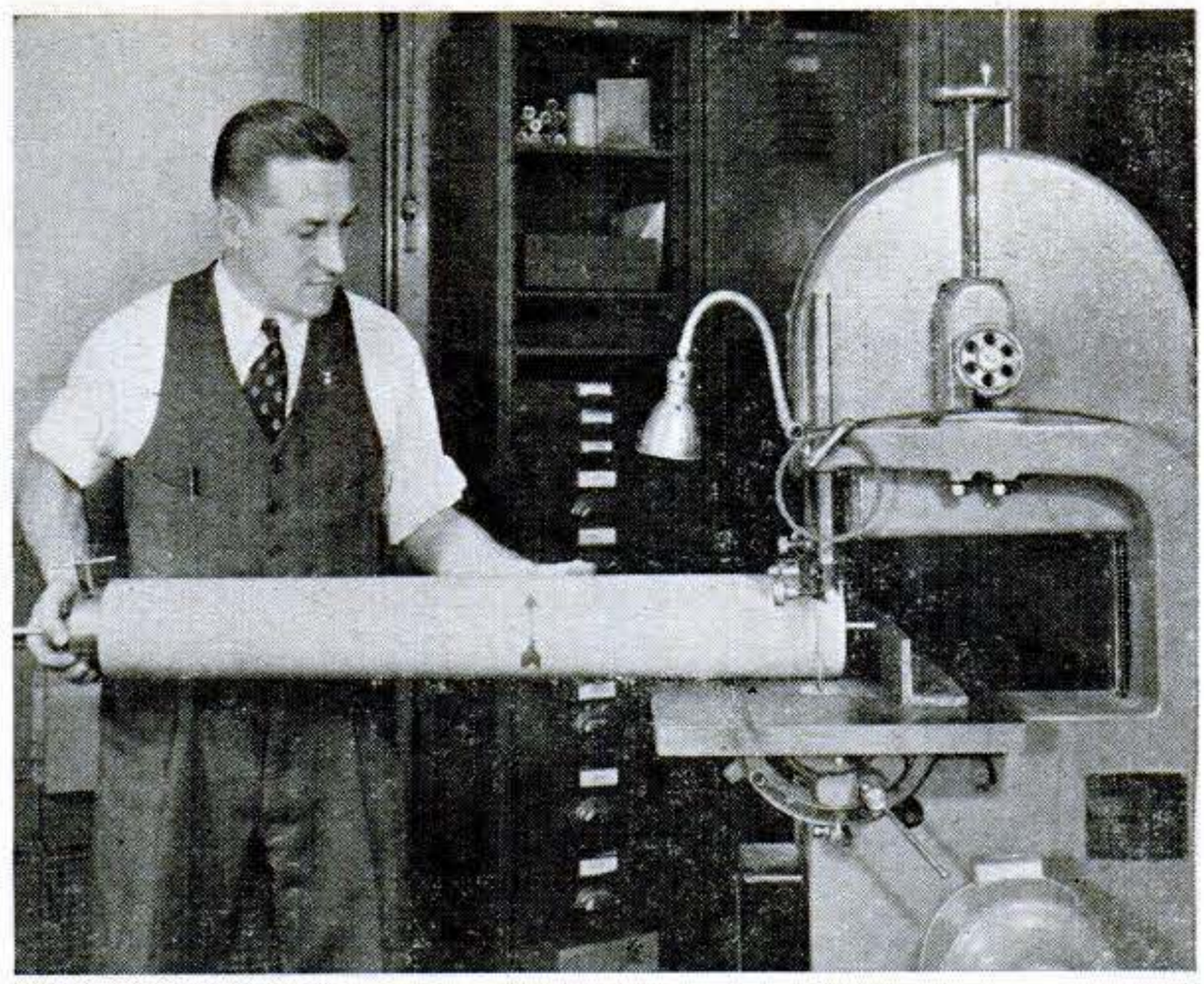
New Shop Ideas

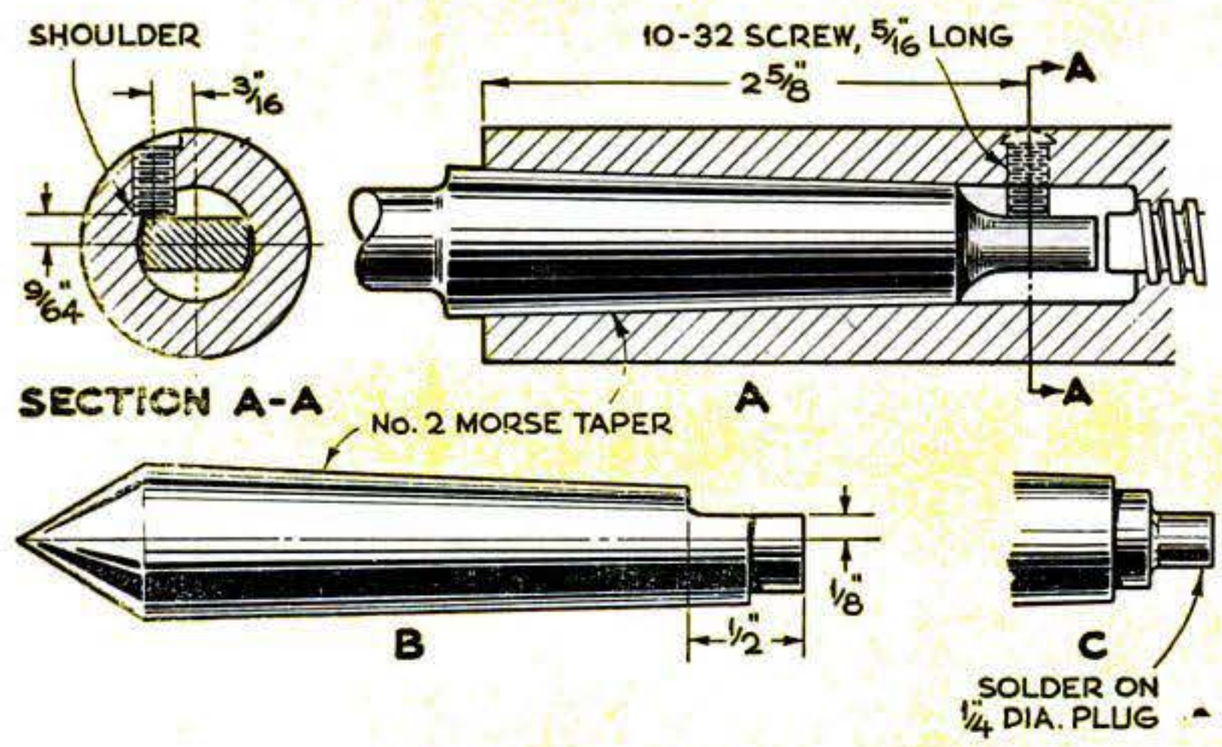


Bandsaw Subs for Lathe. Squaring the ends of large-diameter tubing, or turning off rings of uniform width, ordinarily calls for a good-sized lathe. But with a long rod centered in two disks, you can handle these jobs on a bandsaw or circular saw.

The disks should fit inside the tube closely and have accurate center holes. At least one disk must have provision for clamping the rod fast. In the photo, a disk is being used at one end and a three-jaw universal chuck at the other. The spindle hole of the chuck was fitted with an adapter that was bored to suit the rod and drilled and tapped for a clamping setscrew. Using the chuck eliminates the fitting of a second disk.

One end of the rod is rounded to a blunt point. It extends past the end of the tube to bear against a vertical face clamped to the table. A true cut is obtained by cutting only through the thickness of the tube, and then revolving it against saw-tooth travel. Rings 1/16″ wide have been cut this way.

The setup may be used to cut annular grooves by clamping a second stop against the upright to limit movement toward the saw.—*Frank Reck, Flushing, N.Y.*



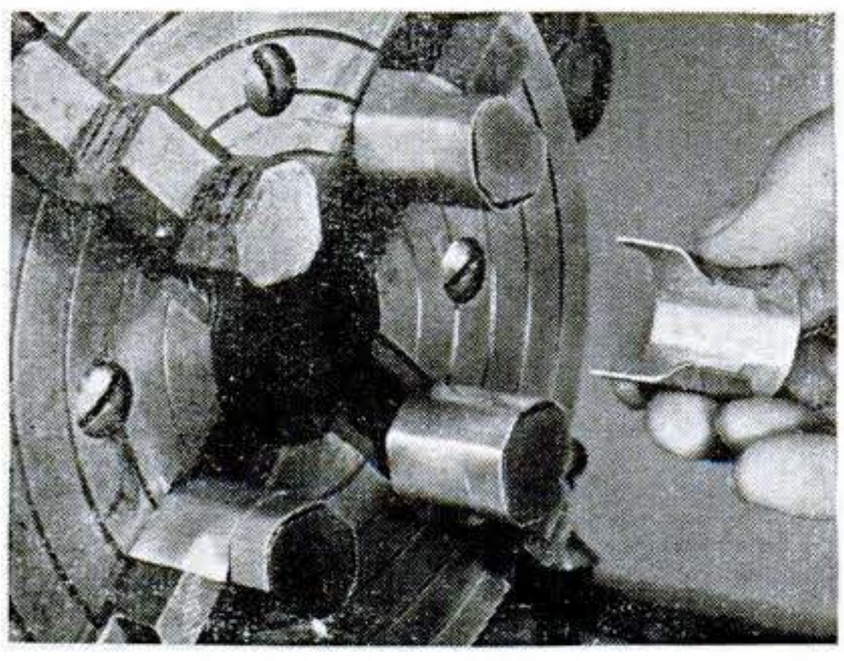
Locking Taper Shanks. When taper-shank drills twist in the tailstock socket, the internal taper may be permanently damaged. Holding the drill with a wrench is uncertain. Besides, this takes a hand you may need elsewhere.

For a permanent and sure lock to prevent taper shanks from turning, drill and tap a hole for a 10-32 headless setscrew in the tailstock ram as shown above, locating it 3/16″ off center so that the screw will bottom against a shoulder. Clearance of 1/64″ should remain between it and the tang of an inserted drill.

If the screw prevents centers or other tapers from seating, grind clearance on them as at B. Should it prevent ejection of short shanks, solder small plugs on as at C.—*Bernard J. Corey, Thorold, Ont.*

Clips Prevent Scoring. It's common practice to wrap shim stock around finished shafts to keep chuck jaws from marring them. But when you have to handle a lot of pieces, the extra operation becomes a time-consuming nuisance.

The shims shown below have to be put on the chuck jaws only once for a run of work, and save a lot of fussing. Cut them from soft sheet copper, with two slits about a third of the way from one end. Hold them on by clamping something in the chuck. Then tap each shim into shape over its jaw with a soft hammer. The clips stay put, but can be slipped off in a moment. —*Harry L. Truchelut, Atlanta.*



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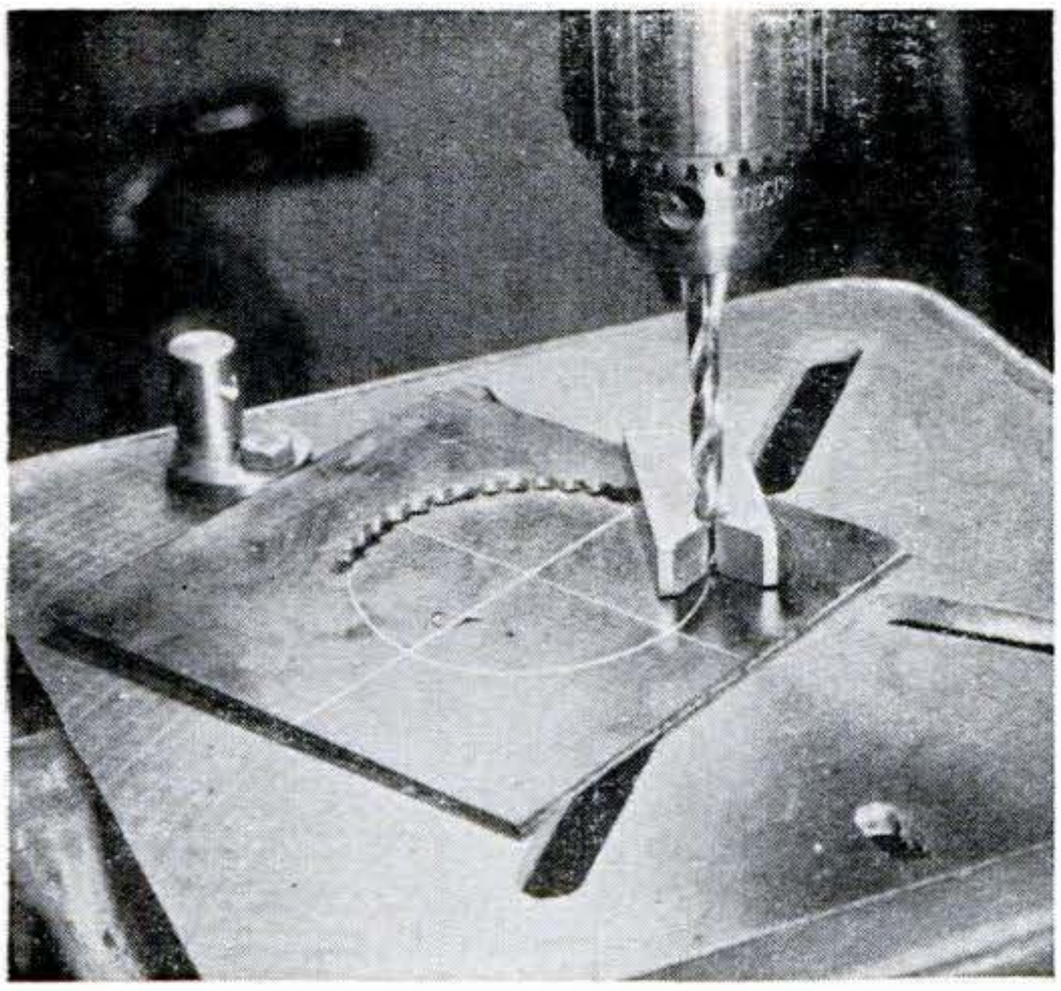
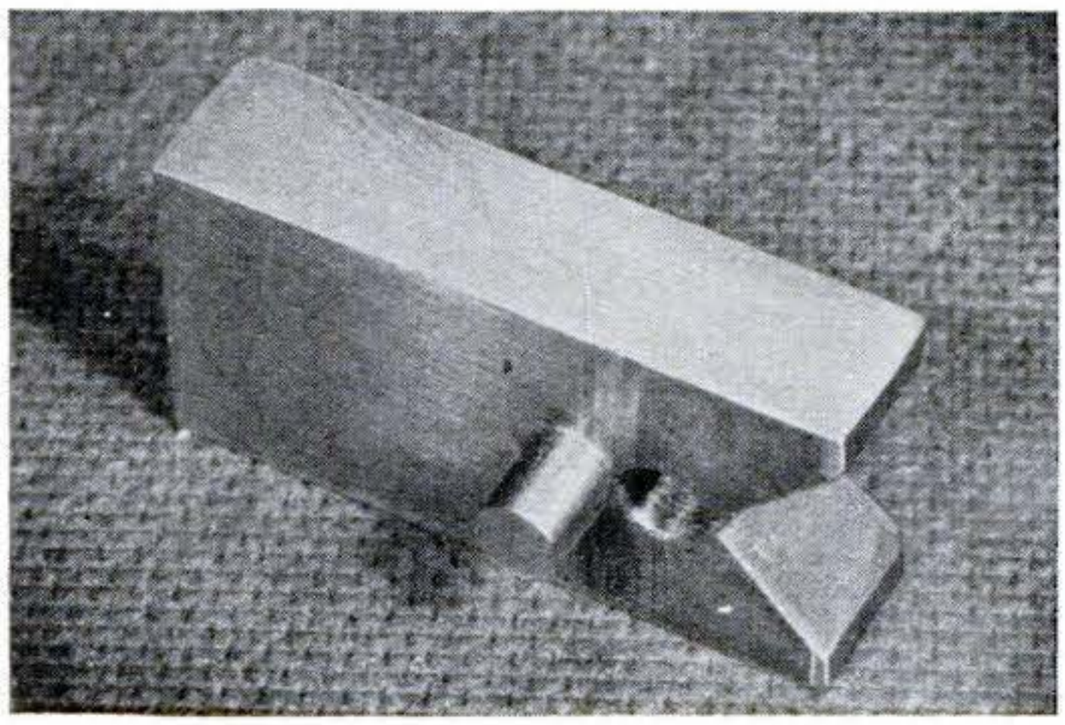


Overlapping Holes. One easy way to cut a big opening—by drilling a series of holes around it—is often hard in practice. The drill tends to fall into the preceding hole, or if the holes are spaced farther apart, the metal between must be chiseled away. And the ragged opening calls for considerable cleaning up.

This jig will produce uniformly overlapping holes, with no tie between. Clamp a ½″ by ¾″ by 1½″ piece of steel on the drill-press table and carefully drill two holes, with the desired amount of overlap, near one end. File or mill a notch in from the end so that it just nicks the outside hole.

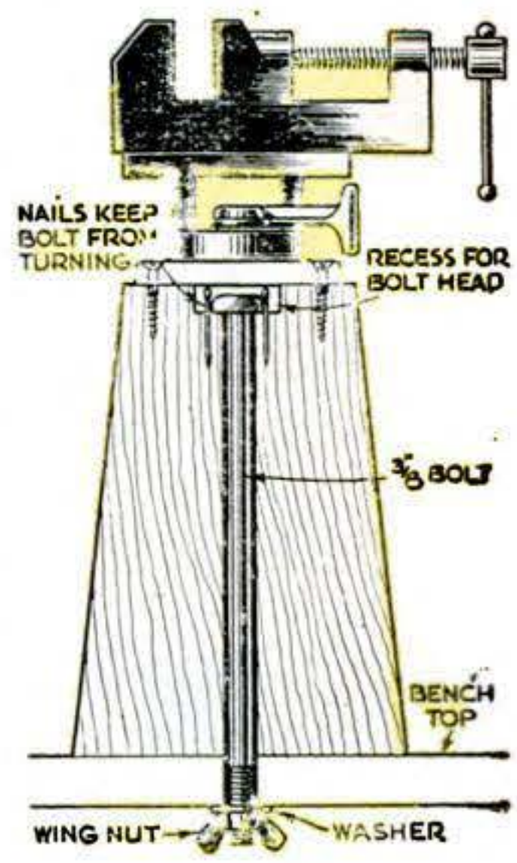
Make a ⅝″-long pin a drive fit in the inner hole, with the ⅛″ that will project slightly smaller. File a flat along the pin. Drive it in with the flat facing the other hole so that the drill may enter freely.

To use the jig (shown in close-up below), punch-mark and drill the first hole. Drop the pin in this, and center the jig on the layout line by sighting into the notch. Repeat for each hole. For production work, the jig should preferably be hardened.—*Will Thomas, Buffalo.*



Close-Up Vise. Preferring to do delicate work near eye level, I made this bench-top support for my swivel-base drill vise. It is a truncated cone turned from wood. A long through bolt clamps it on the bench.

The swivel base of the vise is secured with wood screws. It takes only a moment to attach the vise or, by loosening a setscrew, to detach it for use on the drill press.



Instead of a wooden support, you might weld ends into a 7″ length of 3″ pipe, tapping holes for hold-down bolts, or simply screw two floor flanges onto a piece of 1½″ pipe.—*Carl Tretin, Austin, Minn.*

Ball Protects Shaft. In trial assemblies, frequent tightening of a setscrew may mar a shaft enough to make it jam in close-fitting bearings or pulley bores. A steel ball under the setscrew will prevent this. Use the largest ball that will enter the hole freely.

As the screw is tightened, the ball will make only a small dimple on the shaft. This doesn't project or enlarge the shaft. But you can use it to locate a flat to be filed for the setscrew. Remove the ball when making the final assembly.

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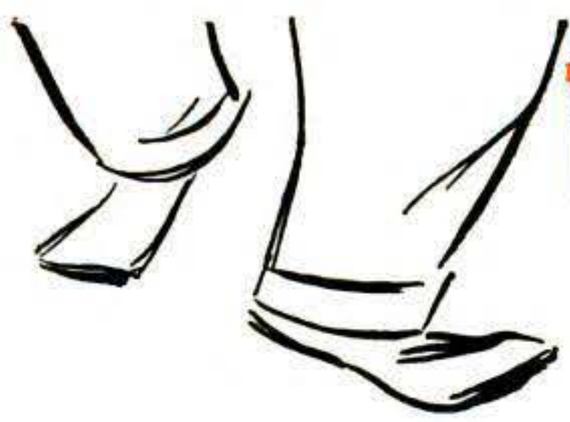
RADIATORS Those lined up before the headquarters of this wrecking company in Yonkers, N. Y., sell for $1.10 a section. All of the photos on these pages were shot at this shop.

You Can Get Bargains from a House Wrecker



One man's junk is another man's prize. Haunting house graveyards is one way to beat the high cost of home improvements.

STAIRS This stairway would sell for around $10—complete. Railing above would go for $20. Lumber in background is only a small part of yard's stock of used beams, studding, flooring, siding, sheathing and molding.

DOORS Complete with hardware, they sell for $4 and up (for one that would cost $12 new without hardware). Often you can buy a fitted frame and door jamb too. If you don't find a door the exact size you need, pick one slightly larger and trim it down.

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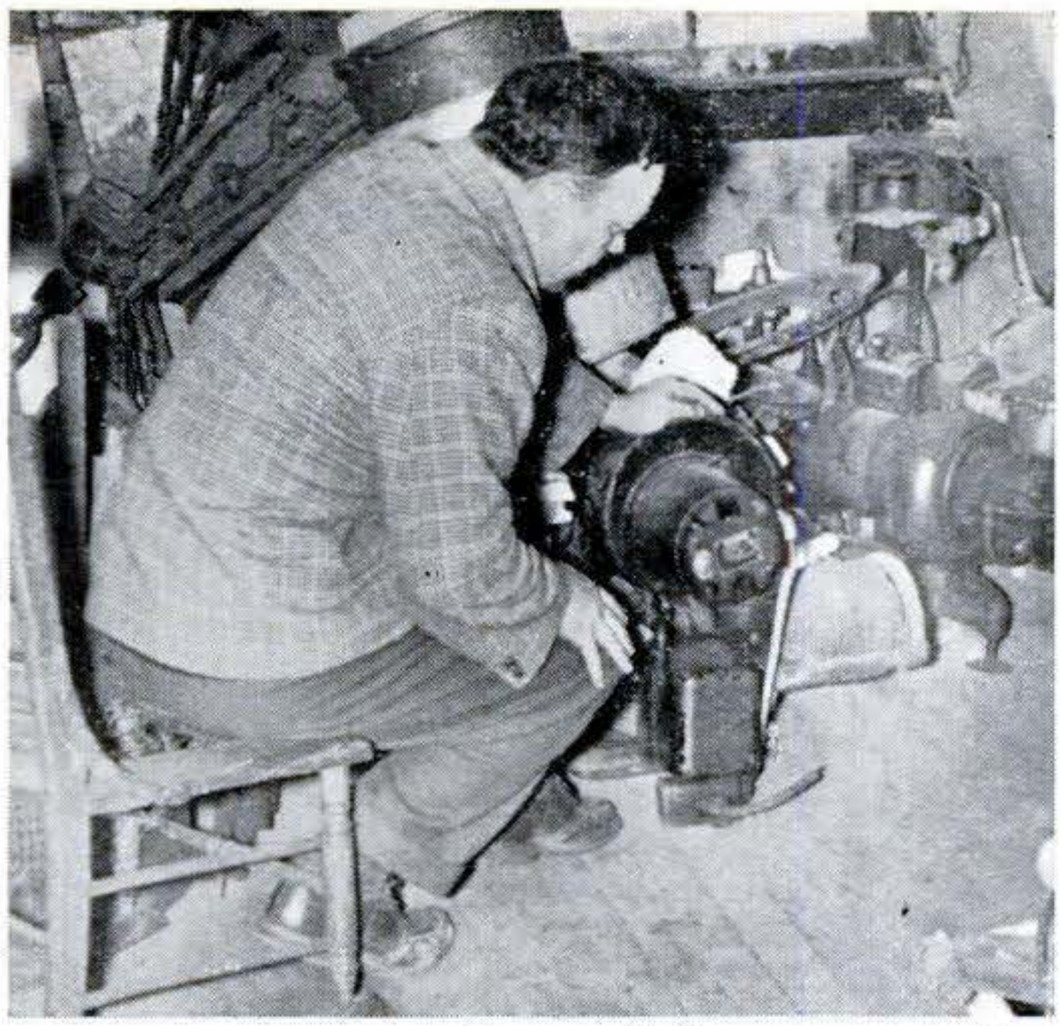
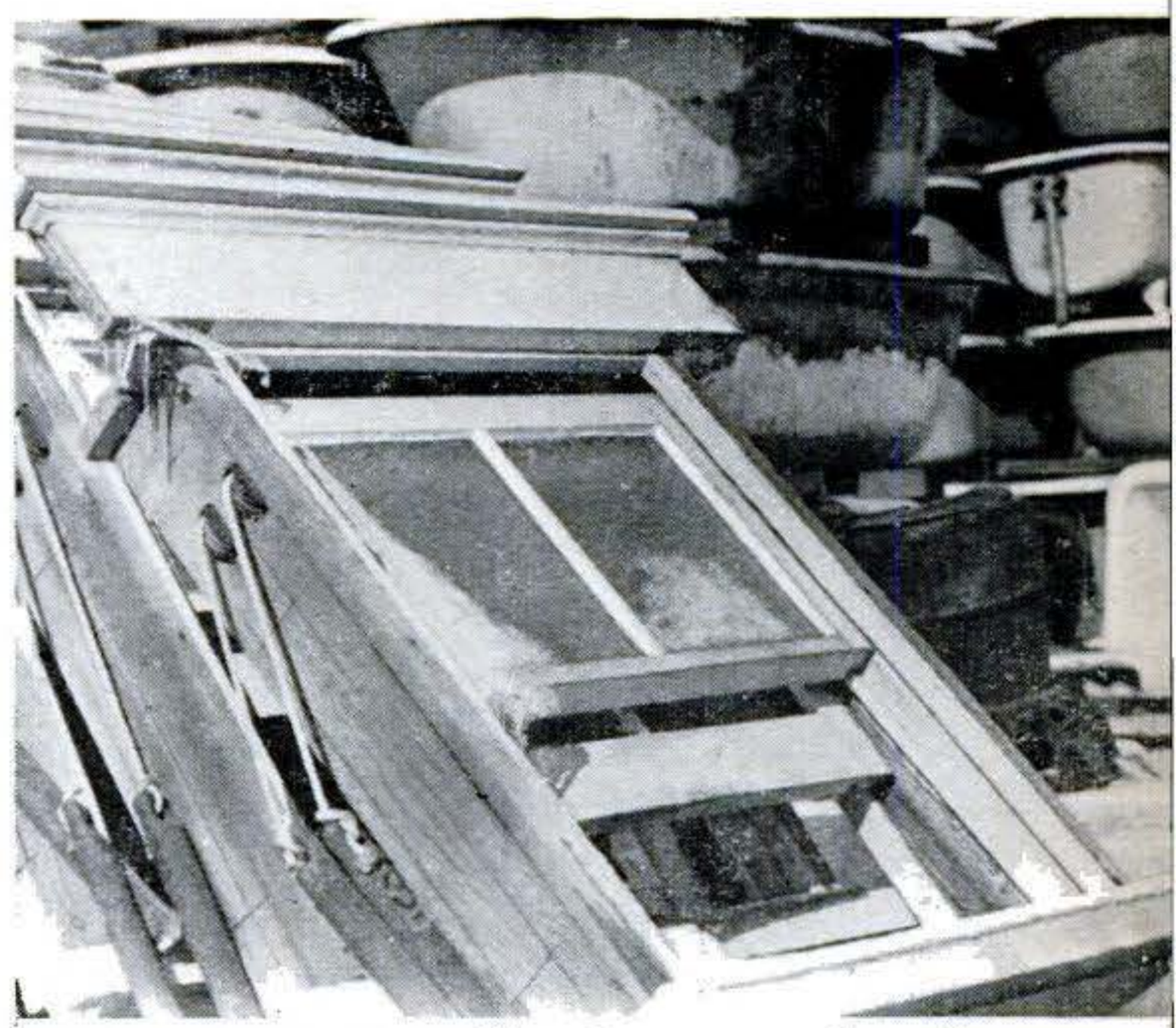


OIL BURNERS Some of them may need a complete overhaul, perhaps several new parts, but a price of approximately $25 may make a used burner a good bet.



WINDOWS Units like these, complete down to sash weights and cords, are available in all types. They sell for about $8. Some good bathtub buys in background.

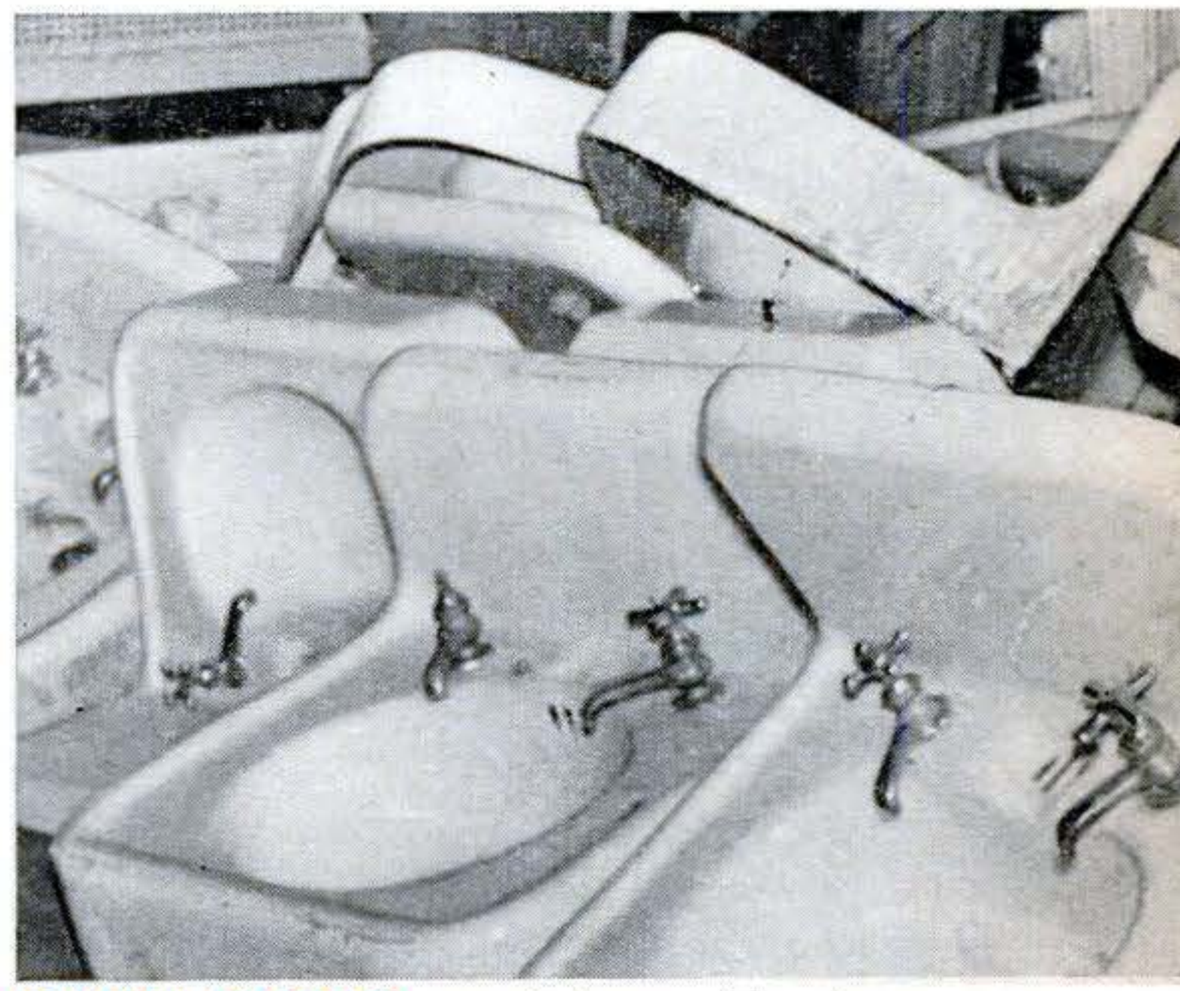
THERE are two parts to a house wrecker's business. He tears down old homes and other buildings. And he sells the lumber and other items he has salvaged.

You can cash in on the second part. Lumber, for instance, usually goes for just plain half price. You may have to pull out the nails—but your labor will be well rewarded. You'll have seasoned wood at a big saving over the cost of new lumber, which incidentally might still be green.

A wrecker's contract often includes everything, right down to the shrubbery. That's why you can find just about any item under the sun in a wrecker's yard.

To locate the wrecker who operates in your neighborhood, ask around where a gas station or store has recently risen on the site of a fine old house. Chances are you'll find someone who remembers who it was that pulled the old place down. The wrecker may have come 30 or 40 miles to do the job, but in most cases he's willing to deliver whatever you buy.

SHUTTERS All types and sizes are on hand here, from giant old slatted models to trim little cottage types with cutouts of crescents, pine trees and stars. Prices range up from $3.50. And if you'd like a carved mantel, you'll find a good selection of those too.



BATH UNITS Wash basins like these range between $10 and $18. You'll also have a choice of toilets, bathtubs, kitchen sinks, and stationary washtubs. Most of them come equipped with fittings, another saving to you.

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How to Judge Used Power Tools

PART 2

Here are practical pointers that may help you spot trouble before you buy it.

By Darrell Huff

PLANNING to buy a used circular saw? Or jointer, sander, or shaper?

You'll need to know three things about it: Is it the type of tool for *you?* What shape is it in? And what kind of quality was built into it in the first place?

On that last point the manufacturer's name is your first lead. Your second is the manufacturer's literature. From the latter you can learn a good deal about how well the machine in question was built originally.

Begin with the bearings. Are they the sealed kind that have been lubricated for life? If the maker's specifications say they are, you'll know that they have not suffered from lack of lubrication. And they will be easy to replace if that turns out to be necessary.

If they are the unsealed type they may be just as good—provided they have been periodically greased or oiled. Inspect to see if they are dry.

Second question is looseness in a bearing. This may be a product of wear, and can only be corrected by replacement. Or it may be that the bearing has lost its preload. See if the preload adjustment can be made through a collar or cone. If not, and if the bearing is not replaceable, the machine is practically useless.

Finally, beware of a freshly enameled machine. New paint may hide a crack.

Circular saw: Look out for a cracked table and worn bearings

DECIDE first if this one is big enough for you. Big has three meanings here: Depth of cut, horsepower of motor, area of table.

If you're going to build houses with it, you'll likely prefer a 10″ or 12″ saw with plenty of table and at least a ¾-hp. motor. But for most home-workshop jobs an 8″ saw will have enough depth and a half-horsepower motor will power it.

Now for the details:

1. Is the saw table cracked or warped? Check it with a straightedge. If it is damaged or off-flat, you don't want the machine—unless a replacement table is available at a reasonable price. A look at the underside of the table will tell you how well it was built; heavy ribbing is more important than thickness in giving strength.

2. Examine rip fence and miter gauge. Adjust the fence to see how easy it is to use. Is the miter gauge accurate, and can it be adjusted to accuracy if it is not?

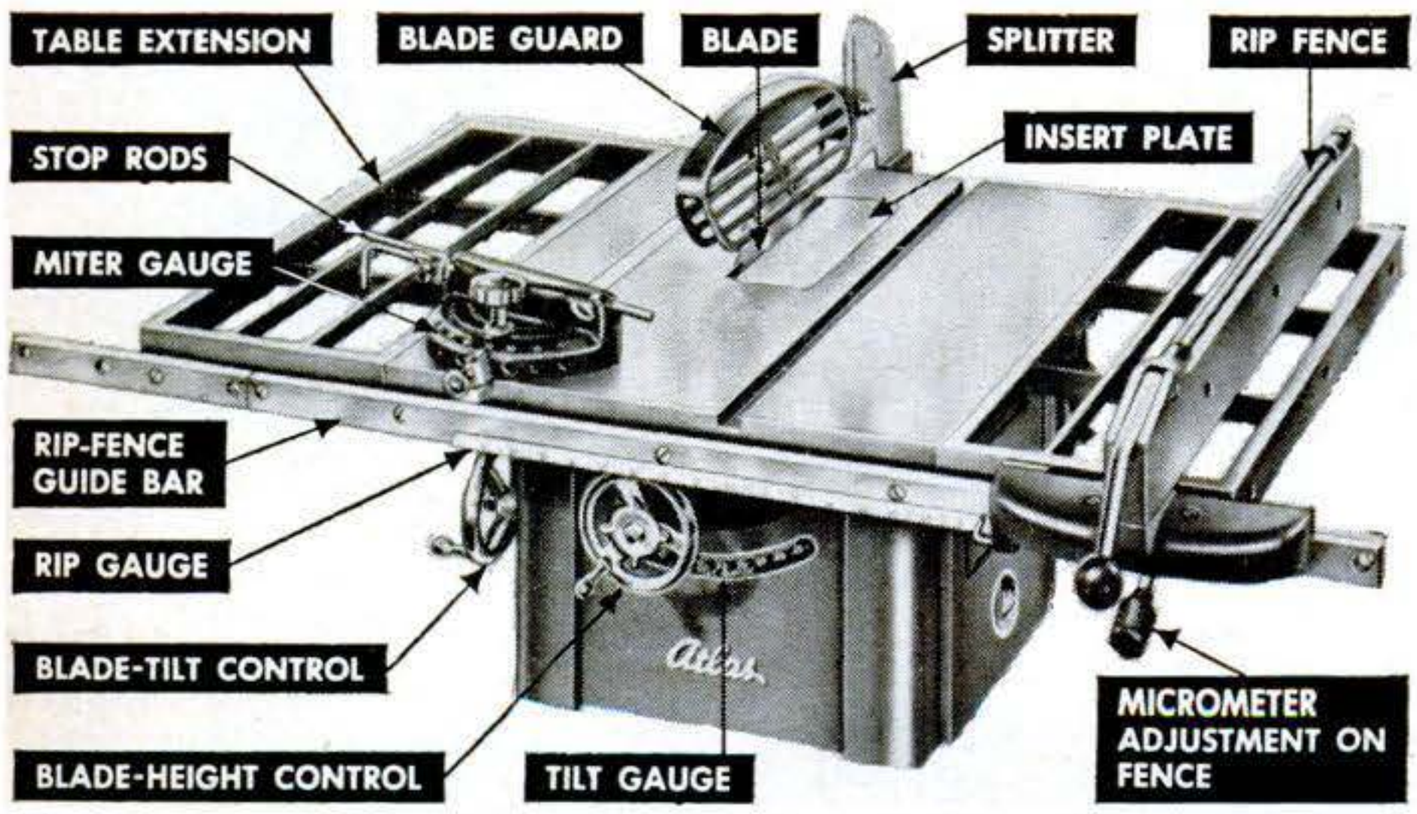
3. Inspect the arbor supports and trunnions, watching closely for inconspicuous cracks. Trunnions can be replaced but you'll want to figure their cost into the price you are paying.

4. Work the controls that tilt the saw arbor or table. They should work freely or they'll be a nuisance, and you may be in for trouble.

5. Actually use the saw if power is available. If there is any hidden damage, your ear is likely to find it for you.

6. Look for lateral play in the spindle. Such play usually indicates worn bearings.

7. A loose pulley on the



These are visible working parts of typical circular saw. Check them for suitability, size and working condition.

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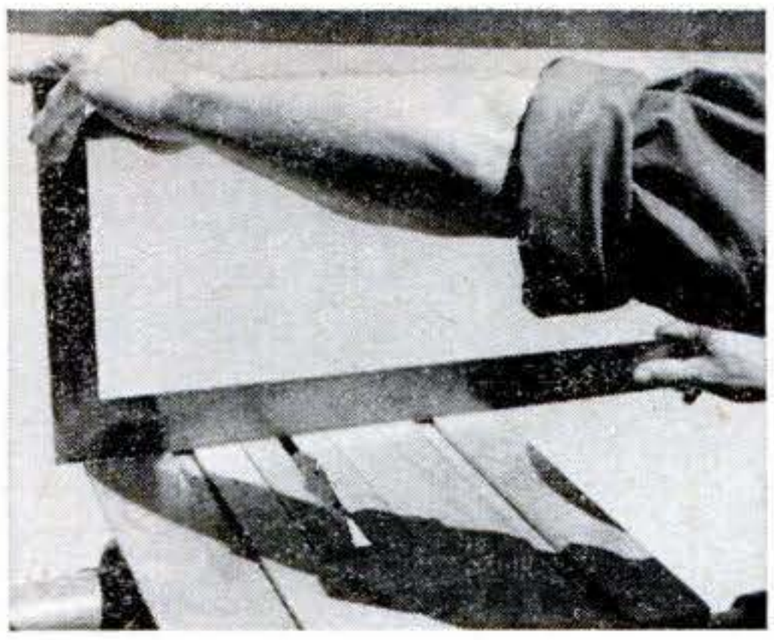
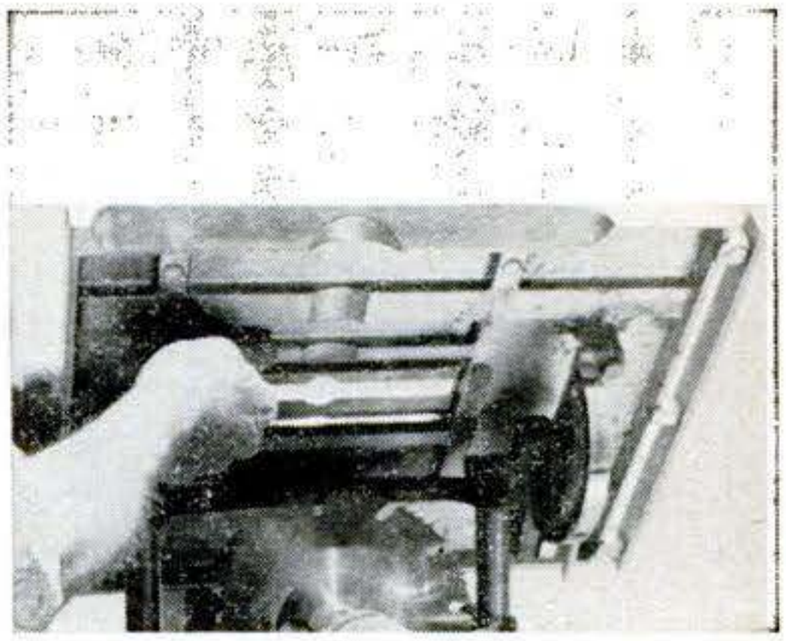


Accuracy of the saw table is important and is easy to check. Use a straightedge or framing square (left) that you can trust.

What you see from underside (right) is clue to quality and condition. Heavy ribbing indicates saw table that is likely to stay flat.

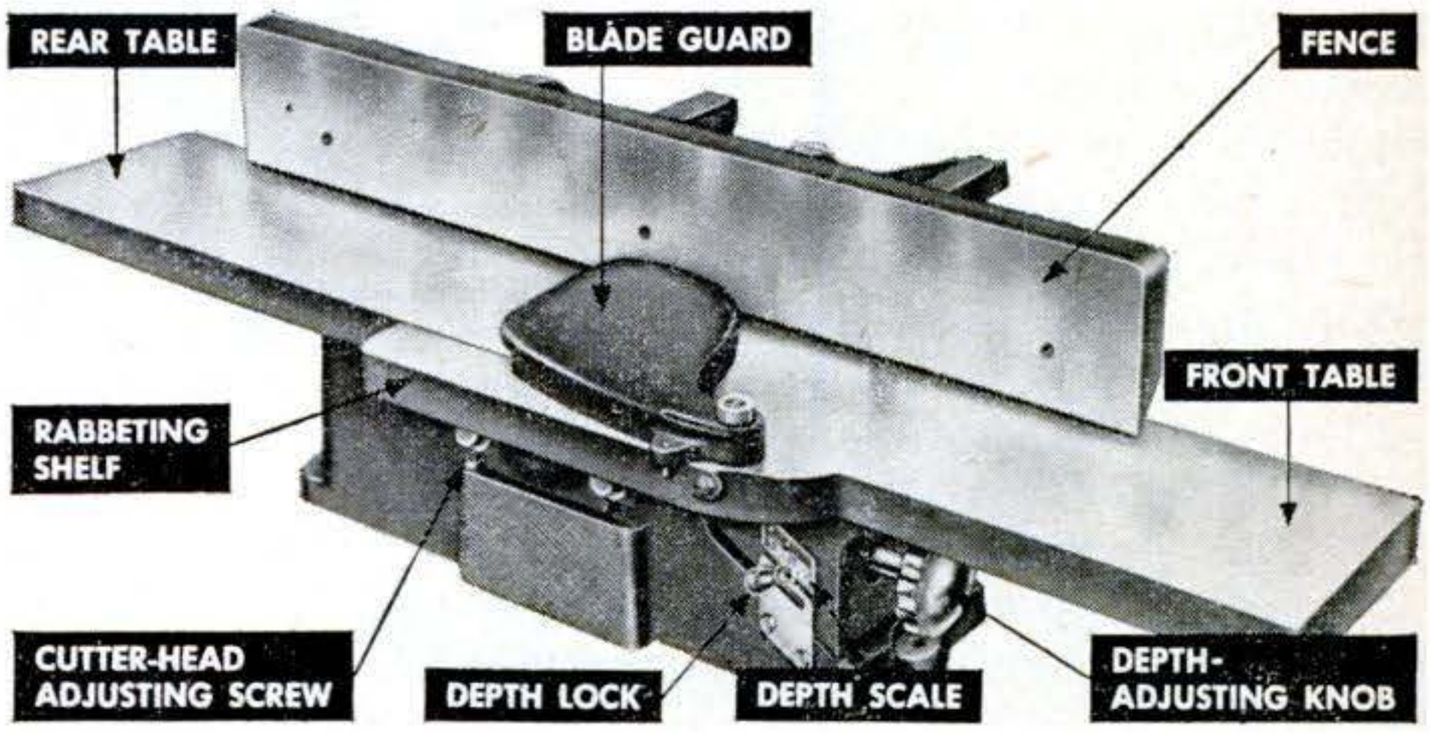


end of the spindle is apt to have scored the spindle shaft. Inspect to see if you're going to have to buy a new spindle.

8. Check to see if the blade aligns with the table grooves. Run the blade all the way up. Lay a straightedge against it. Then measure from both ends of the straightedge to the grooves. The distances at both ends should be the same. Sprung trunnions can cause the blade to be out of line.

Jointer: Do the controls work smoothly? Is the table warped?

ANY well made jointer in good condition will do its main job—producing true, flat edges, the kind you need when glueing up stock. But if you want it for other tasks, you'll have to examine it with these in mind. A good jointer is handy for beveling, chamfering, rabbeting and for surfacing lumber. A jointer is not a thickness planer, but you can make a 6″ model do a pretty good job of surfacing stock up to 12″ wide.



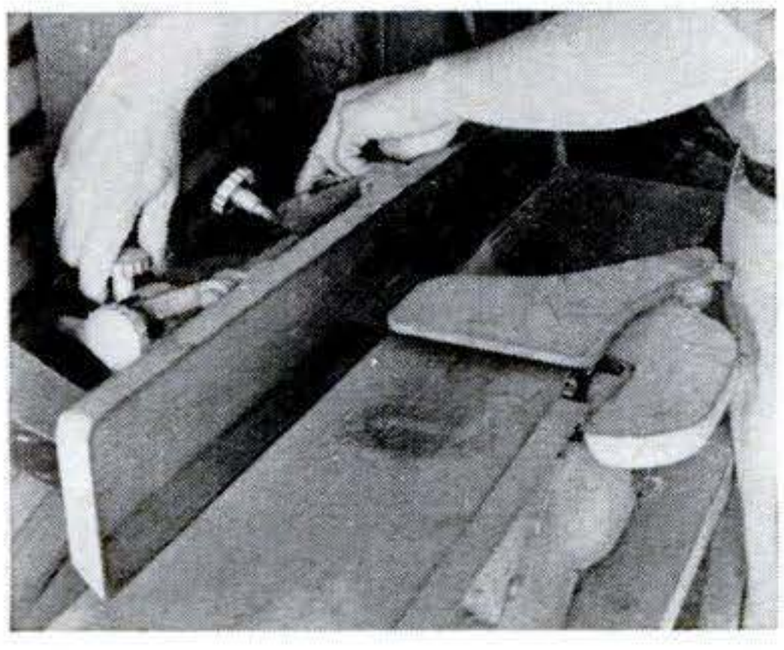
Important parts of jointer are shown above. Check these first: tables and fence for trueness; controls for easy working.

If the capacity is right for you, look at the adjustments. Individual height adjustment of both tables is handy, permitting such operations as spot chamfering. Sealed-for-life ball bearings are important—they'll save you a lot of trouble. If you have the manufacturer's catalogue, see if the knives are high-speed steel. Then start checking condition.

1. Work the various knobs that control the tables to see that everything operates smoothly.

2. Use the fence adjustments. They should loosen easily and lock tightly. A jointer fence that creeps out of square or moves under pressure can ruin a lot of lumber before you discover it. And the fewer the knobs needed to control these adjustments, the handier and more trouble-free the machine is likely to be.

3. Try the spindle for lateral play. If you can wiggle it up and down or from side to side, the bearing housings may be worn



Do fence adjustments (left) work easily and lock tightly? Negative answer to these questions indicated this machine was a poor buy.

Test the setscrews (right) that hold blades in cutter head. A screw that is frozen or broken off means trouble, maybe a new head.

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so badly accurate work is impossible.

4. Use a straightedge to check for warping of the table. You might as well abandon any jointer with a bowed table. Also bring the tables to the same level and check diagonally—from corner to corner both ways.

5. Search for broken castings. Small ones can usually be replaced at minor cost, but be sure replacements are to be had before you buy.

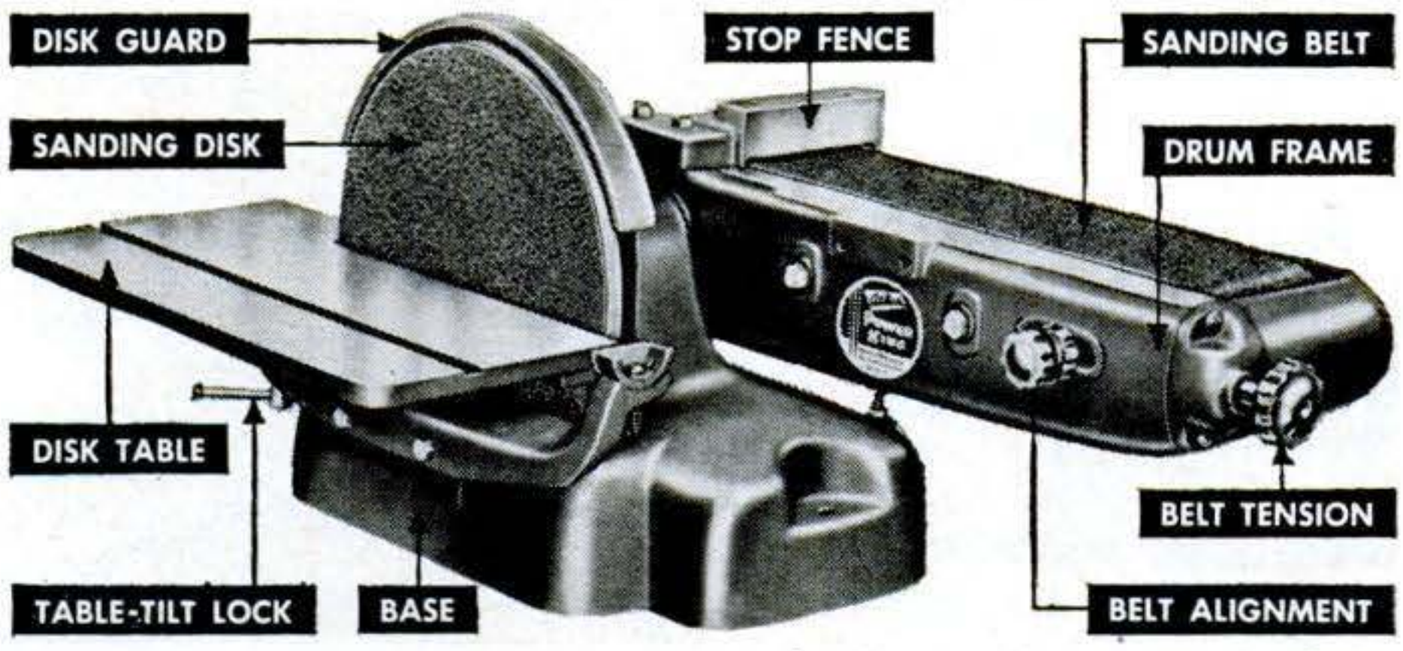
6. More than likely the knives will need sharpening. Can they be sharpened and then locked again *safely* in the head? Or should you add the price of new knives, and maybe a head as well, to the cost?

7. Try removing the screws that hold the blades in the head. If a screw won't come out, it may be broken. Removing a broken screw can be quite an operation and there's little use buying yourself into grief like that.

8. Buying a jointer without a blade guard is buying a hazard for your shop. Be sure there is a guard and that it works.

Sander: Suitability to your needs is the first consideration

THE question of suitability to your particular needs hinges mostly on whether or not you will own more than one kind of sander. If, for instance, you will have a disk sander available (or if it comes in combination with a belt sander) you won't ask the belt model to do any tricky operations. You'll use the latter mostly for sanding surfaces and edges of lumber.



Common types of bench sanders for home shops are the belt, disk, and a combination of the two, which is shown above.

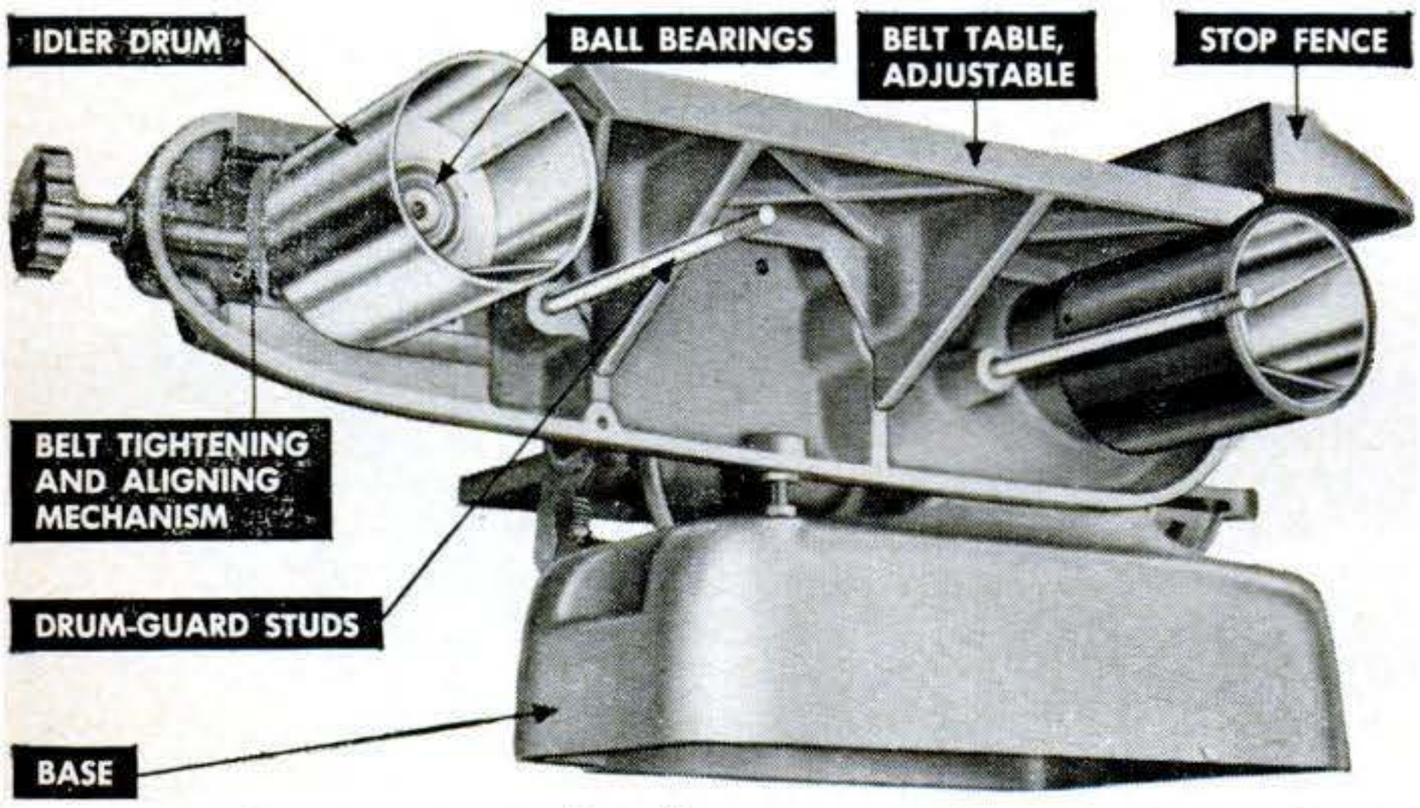
But if you expect the belt finishing machine to do the work commonly done with a disk, then it must have the proper table, one that will tilt within an adequate range. Accuracy is important, since you can use a sander to true up all sorts of cuts.

1. On the belt machine, examine the drums for cracks. If you can run the machine, see if it tracks properly. A sanding belt that won't stay in position as it runs often indicates a bent shaft. Make sure all the tracking controls are in good order.

2. Excess vibration in running is another indication that some part may be out of true.

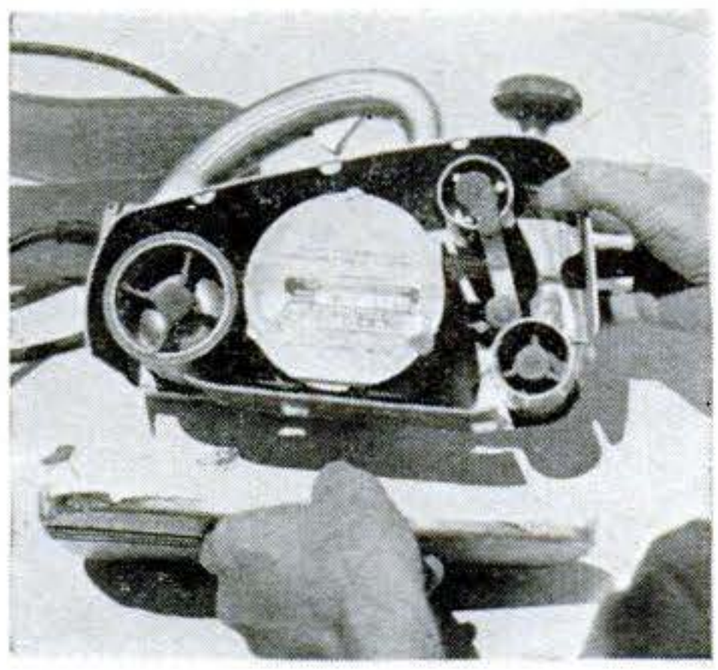
3. You can best check a disk sander (or the sanding disk on a combination sander) by running it. Listen for vibration. Let some object rest on the table while the machine is running; bad vibration will make the object hop around. At best, such a machine is no fun to use.

4. With a portable belt sander, design is an important consideration. Will the sander work close to an edge? Will it get into corners? For some jobs, these are prime questions, but if you intend using it merely



Examine the drums and tightening mechanism shown here. Look for cracks and worn parts that make tracking unreliable.

Worn guides that may be hard to replace were found when this portable belt sander was opened. Note that cover plate has been chewed by the belt.



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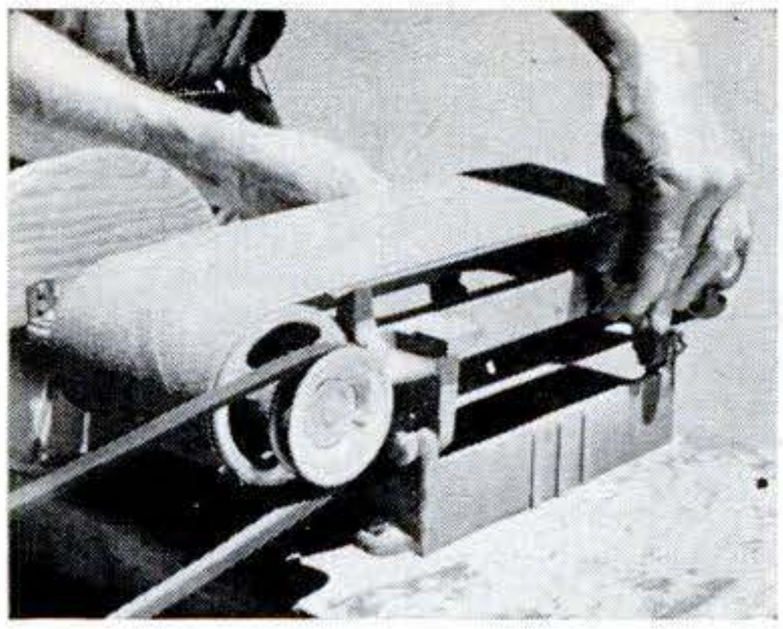
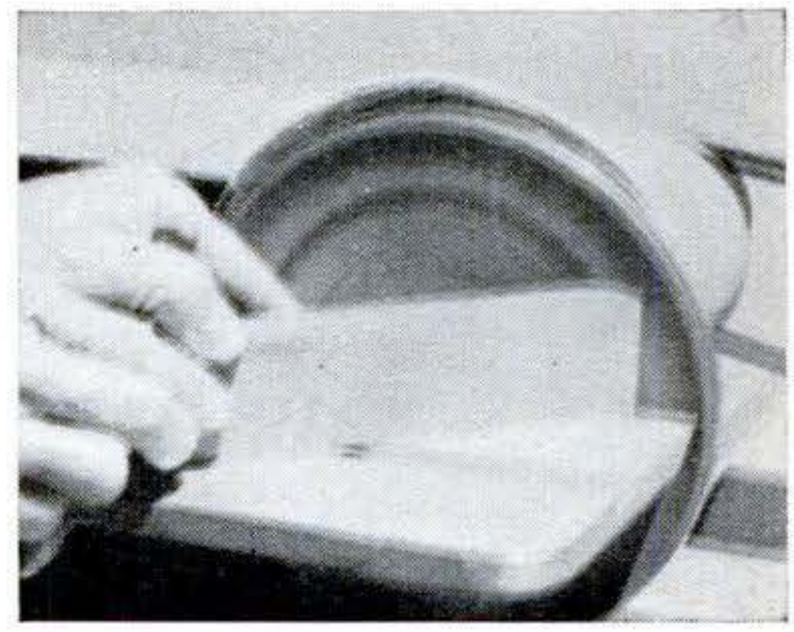


This buyer is trying condition of tightening knobs (left). Jagged casting may indicate that belt has often failed to track properly.

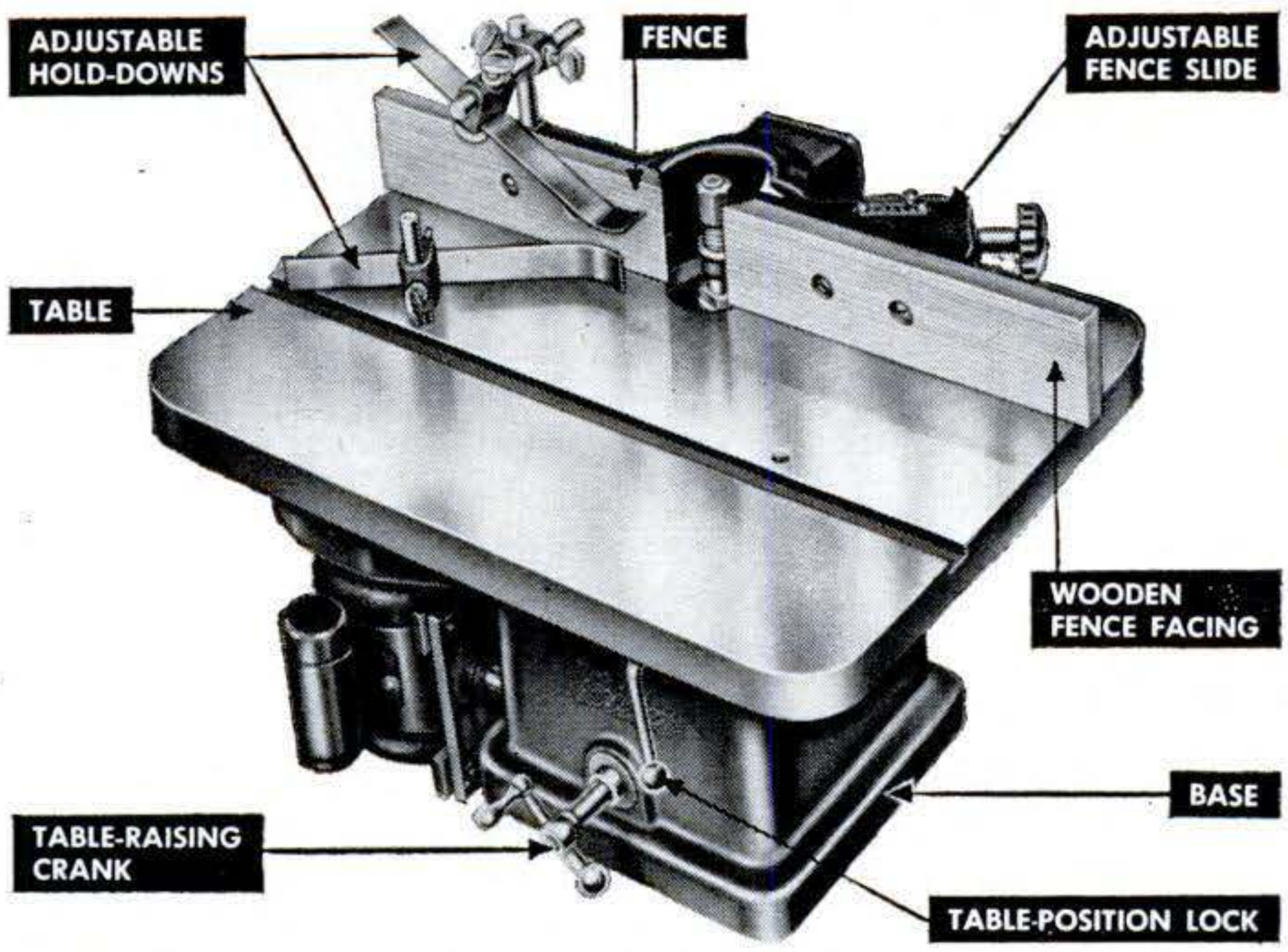
Bad vibration (right) is a serious flaw in a sander. If you can't find a way to correct it, don't give much money for the machine.



to take down table tops, they make little difference.

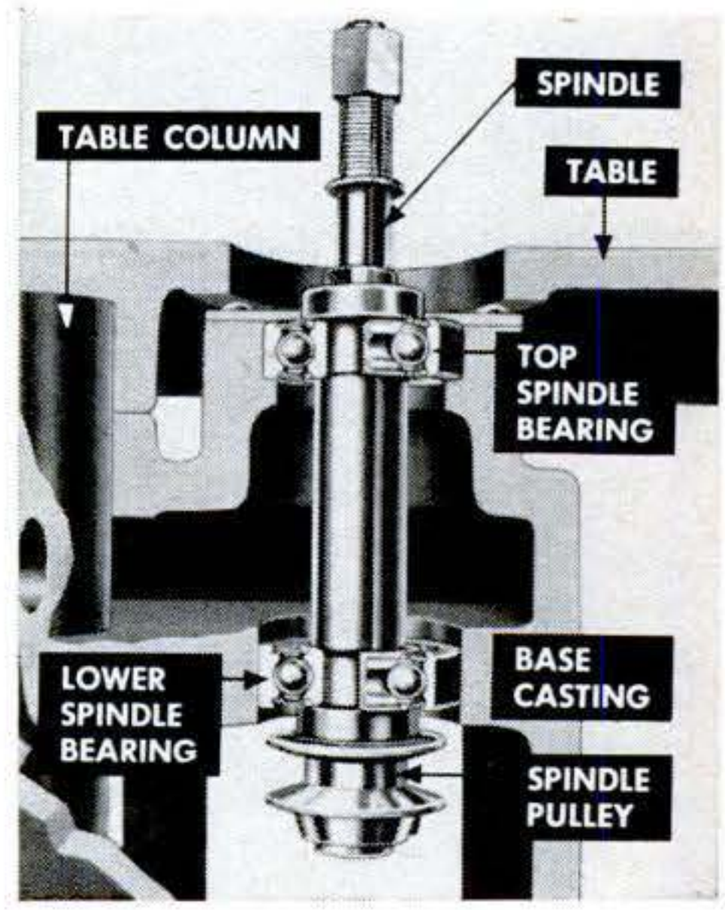
5. In many portable belt sanders, the condition of the guides will tell you a good deal. Open the machine up and inspect the surfaces against which the edge of the belt may bear in running. If the machine tracks badly, these may be cut and so may the housing. With any machine having a motor built in, the condition of that motor is probably the major factor. We'll discuss that in a minute.

Shaper: Check the spindle for lateral play



Here are the controls that need to be checked for easy and positive working. Straightedge will tell you if table is flat.

Heart of shaper is shown in cutaway photo below. Make sure spindle threads are in good condition. Check bearings by trying to wiggle the spindle.



By the time you get to needing a tool like this, you probably know what you want it to do. But there are a few points about condition to remember.

1. Look first at the spindle threads to be sure they are not damaged.

2. Check the spindle for lateral play. If you can move it at all from left to right, it's a good guess that bearings or bearing housings are badly worn. The machine will need a repair job before it will cut satisfactorily.

3. Try the controls to see that they are functioning, and also note how many cutters there are and their condition.

4. Wind up with the usual operating test if power is available. And, in any case, examine closely for cracked castings, cracked or out-of-true table, and the like.

Motor: Is it powerful enough for the job it has to do?

In many tools, the motor is the important thing. This applies especially to portable drills, disk sanders, and grinders, where there are few moving parts outside the motor itself. It applies pretty much, too, to portable sanders, flexible-shaft setups, and to some extent to radial-arm saws which have motors built into them. And, of course, a motor is very often part of the purchase.

Unfortunately it is not often feasible under buying conditions to tear down a motor sufficiently to examine it thoroughly. You

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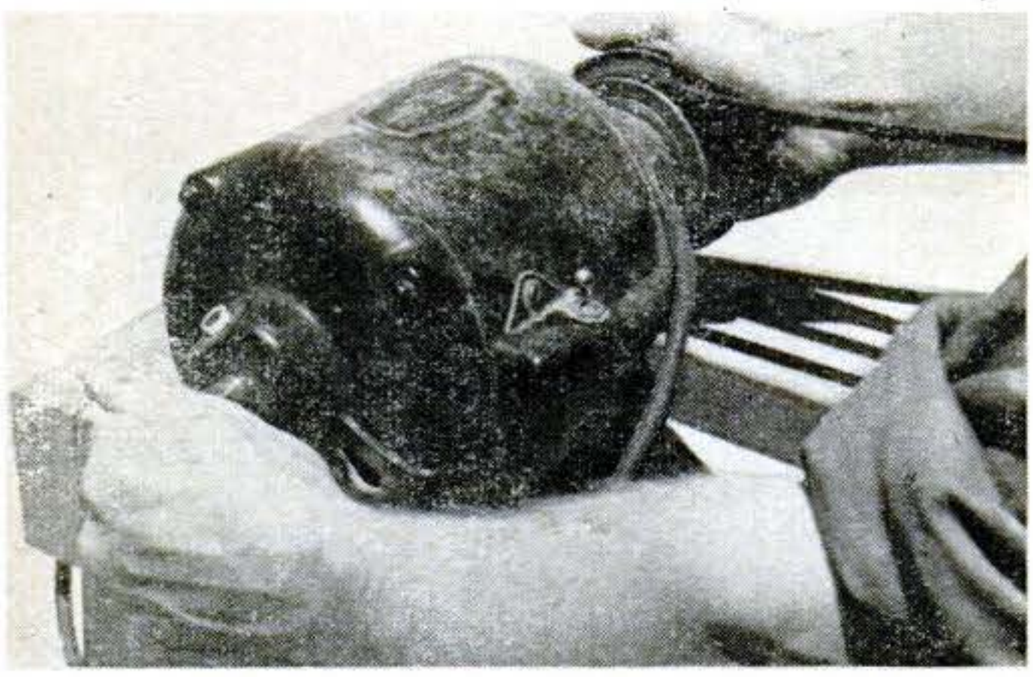
Smell test often will give reason to suspect internal trouble. Off smell indicates partially burned windings and a damaged motor.



If motor shaft won't turn freely, something is wrong with shaft or bearings, or motor has been torn down and then reassembled incorrectly.

have to rely pretty much on external clues.

1. Power is the first question. If you are offered an 8″ circular saw equipped with a ¼-hp. motor, you might as well figure on replacing it. Check the power given on the name plate and compare it with the recommendations of the maker of the tool. Remember that these are figured for average conditions; if your tools are dull or you are doing heavy work, you may need more power. The following power figures are usually recommended, the smaller figure applying to smaller tools or fairly light work, the larger figure to heavy work:

8″ circular saw, ½ or ¾ hp.
10″ circular saw, ¾ or 1 hp.
4½″ jointer, ⅓ or ½ hp.
6″ jointer, ½ or ¾ hp.
Bandsaw, ⅓ or ½ hp.
Shaper, ⅓ or ½ hp.
Belt and disk sander, ¼, ⅓ or ½ hp.
Lathe, ⅓ or ½ hp.
18″ jigsaw, ¼ or ⅓ hp.
24″ jigsaw, ⅓ or ½ hp.
Drill press, ⅓ or ½ hp.

2. Read the name plate to be sure that the motor will work on your current, which is probably 115-volt, 50-60 cycle, single-phase. A three-phase motor is often cheaper, but many homes are not wired for that power. On the other hand, you can use a 220-volt motor to advantage if you have a three-wire supply running to your shop.

3. If the presence of oil holes indicates that a motor is not equipped with sealed bearings, look to see if it shows signs of having been kept lubricated. If you are going to use the motor in a vertical position—as with almost all drill presses—it should be the sealed type. In addition, a drill-press motor should be a ball-bearing type; or, if a sleeve-bearing, it should have an end-thrust bearing.

4. Some kinds of trouble show up on the outside. Inspect for broken or cracked mounting or end plates, bent shafts or burned lead wires.

5. Test for bearing trouble by trying to move the shaft up and down; any movement indicates worn bearings. Turn the shaft by hand: if it does not turn freely, you can suspect bad bearings, a bent shaft or an improperly assembled motor.

6. Availability of winding leads to permit reversing the motor is another desirable feature, though not always needed.

7. *After* completing the tests above, plug in the motor and turn it on. It should start briskly, come up to full speed quickly, and if it is a repulsion-induction type there may be a distinct click as the starting switch cuts out the starting winding. The motor should run without much heating. Signs of internal trouble: slow starting, slow running, smoke, noise.

8. Give it a smell test. Any strange smell suggests partially burned winding and a damaged motor.

9. If the motor refuses to start until you set it off by turning the shaft by hand, it probably has a dirty or burned-out starting switch, burned-out starting windings or a defective capacitor.

10. Excessive sparking in a universal-type motor tells you the commutator needs turning down and the mica separators should be undercut. This job costs only a few dollars, so it is not necessarily a fatal defect. But there is the risk that it may already have been done to the motor so many times that there is little copper left. It's usually hard to tell about this matter without removing one end bell. END

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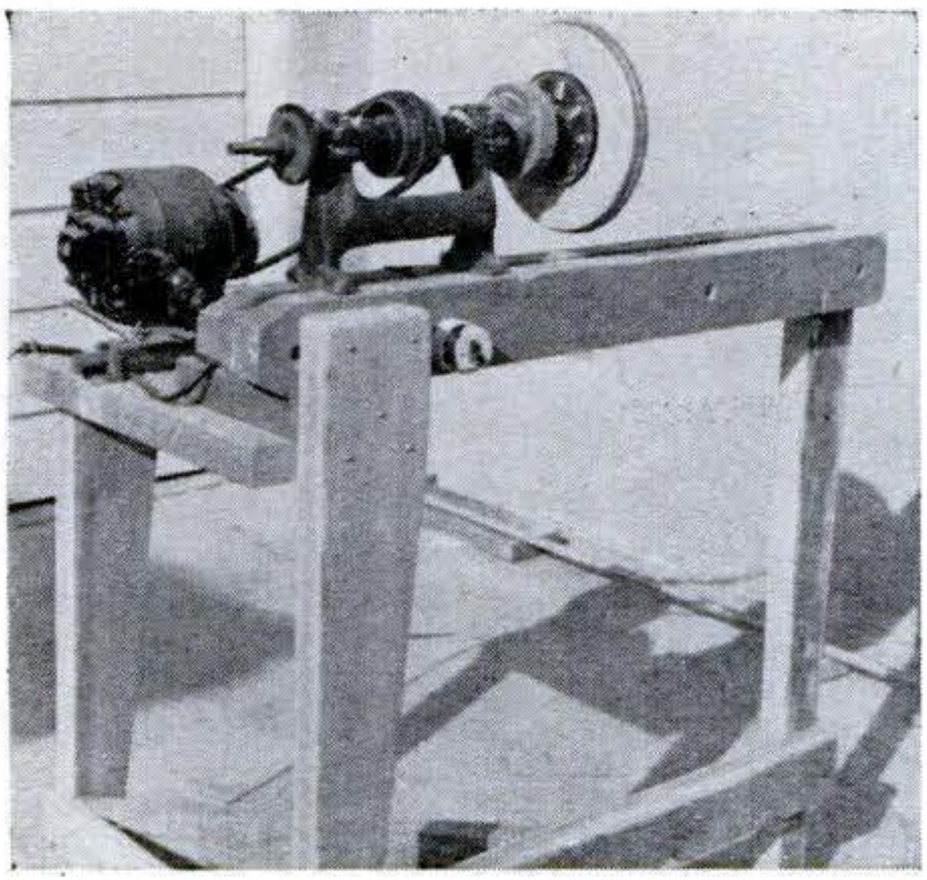
Slicked-Up Tools Work Better

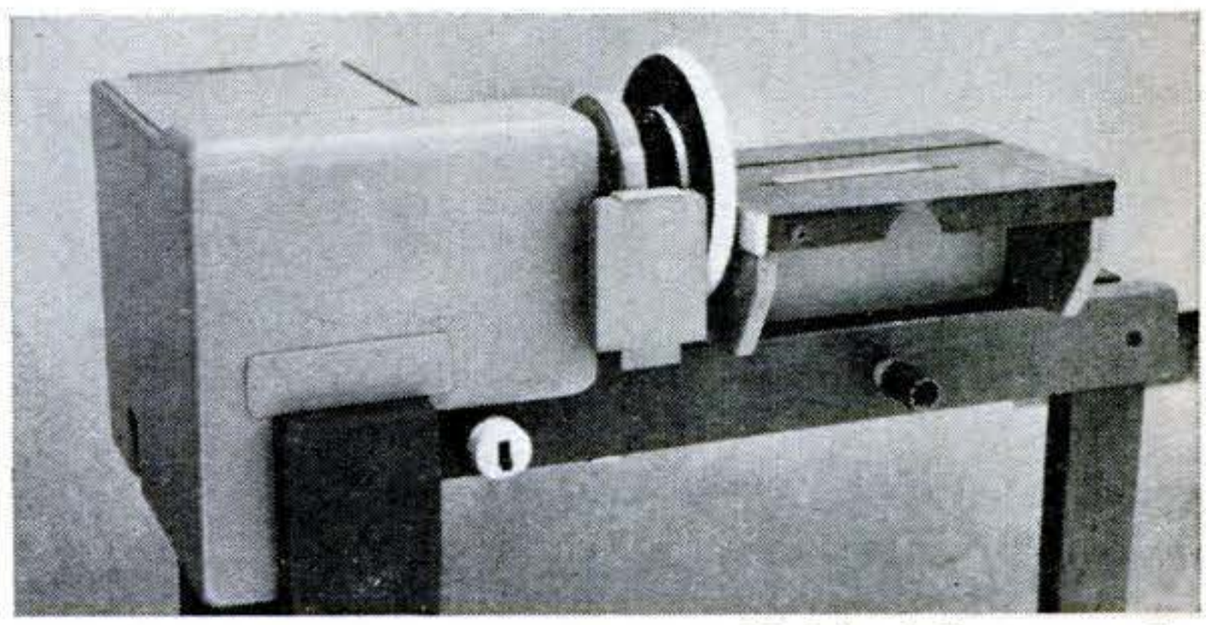
You'll probably snicker politely at prettying up a lathe, but look what a face-lifting job can do for the old machine.

WHY shouldn't a good but old-fashioned machine tool look handsome? If you've bought a secondhand power tool, for instance, you can not only streamline its appearance but also add practical advantages.

Take the case of the disk sander and grinding wheel shown here. Adding a neat cover to the arbor and motor made the machine safer. The flat top of the cover also is handy for parking work or tools. The addition of a tool rest by the wheel and a big sanding table made the machine more useful too.

My lathe also is much more practical since I mounted it on a cabinet. Wood from the old box on which it stood was reworked to make the cabinet. The legs are short pieces of 2″ by 8″ stock, and the plywood doors were salvaged from an old chest. I filled holes and cracks in the old lumber, sanded it smooth and then painted it.—*Robert Hoppough, Encino, Calif.*





Original sander-grinder setup (left) did same jobs as glamorized version (above), but the new version looks better and is much safer to use. Cover keeps fingers and ties out of belt, and grit out of bearings. The sanding table was salvaged from an old circular saw.

On the old lathe setup (left), accessories got dirty and were often mislaid. In the new one (above) the left door of the lathe cabinet can be slipped off its hinges to become a tray for tools. The inside of the right door offers a rack for accessories.

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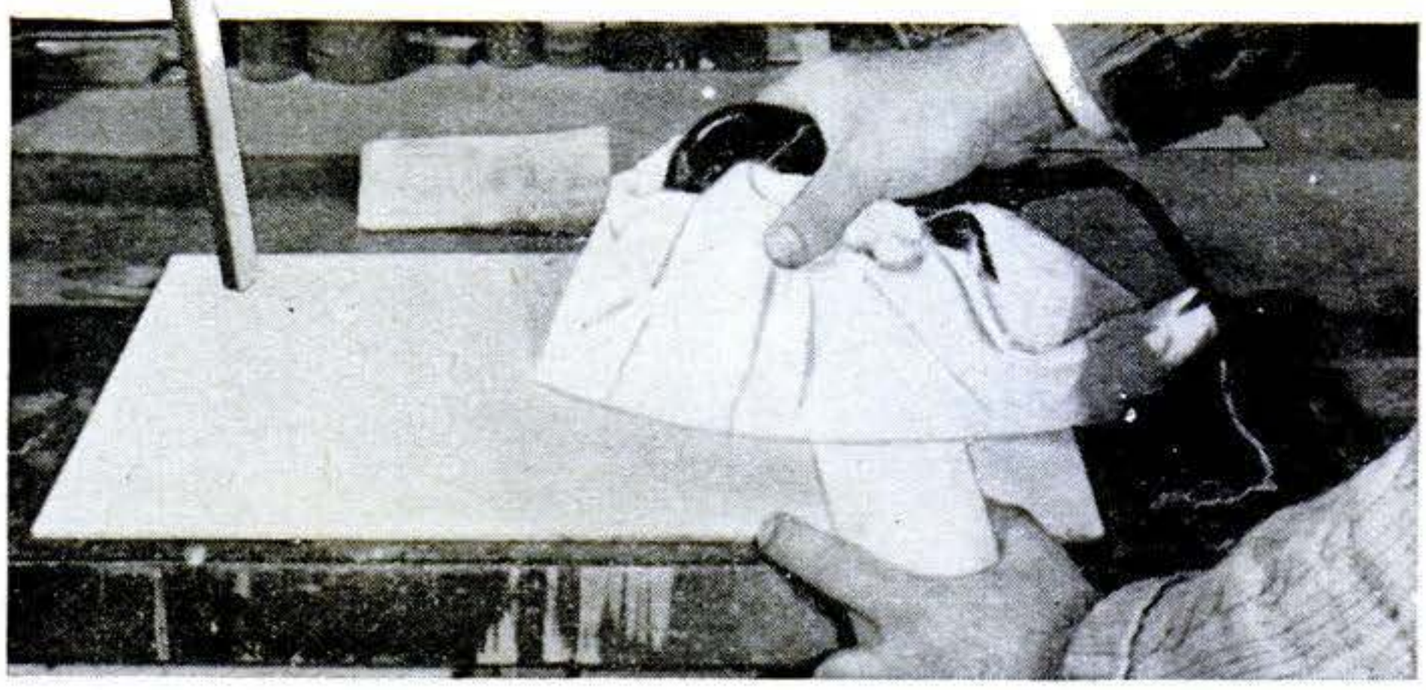
Board Wipes Clean for a New Picture

An easel like this—three strips of wood secured by a machine screw at the top—will keep a youngster quietly occupied for hours. And paper is no problem—wipe the board with a cloth, and crayon drawings disappear.

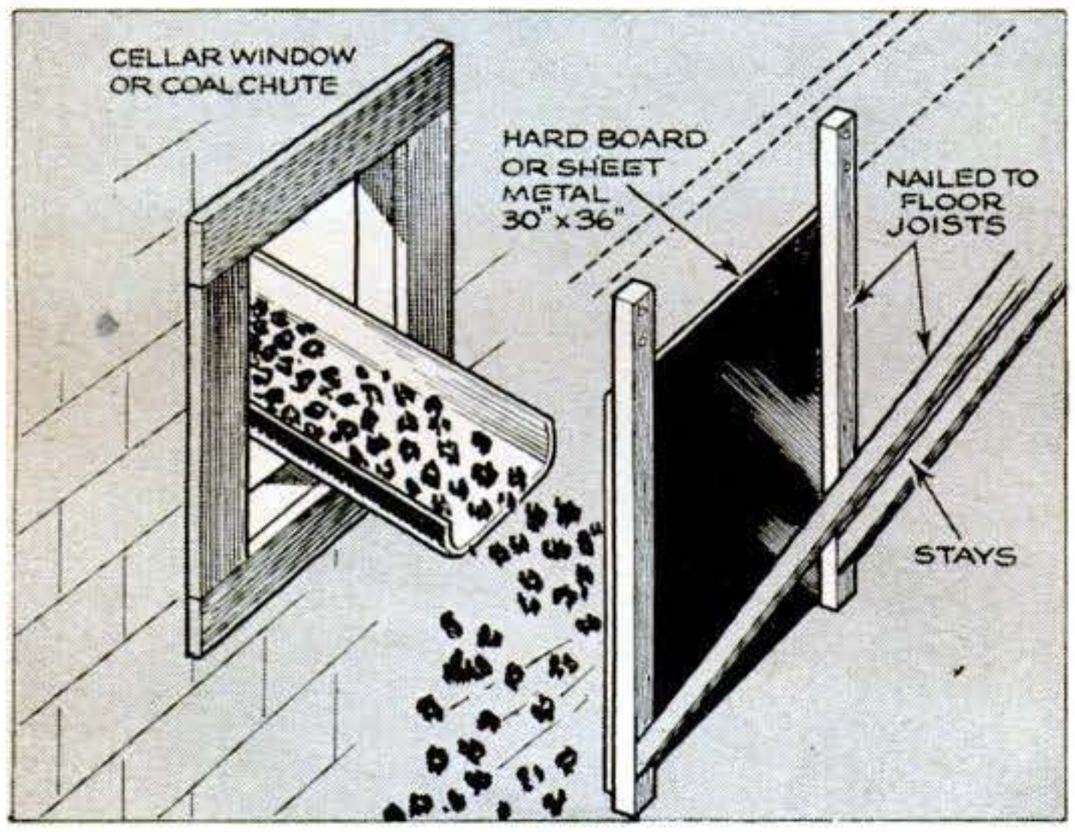
The easel legs are ¾″ by 1⅛″ stock, 48″ long. Trim flats on the front legs at the top so they fit flush against sides of the rear leg. Drill ¼″ blind holes in a 13″ length of two-by-three, which is screwed to the front legs to form the spacer and crayon holder. Window-sash chain ties the rear leg to the spacer.

The 12″ by 17″ drawing board is hard-surfaced composition board, enameled white. Spread paraffin over it with a cloth-covered iron. Don't let the iron get too hot or the enamel may blister. When the wax cools, rub with a cloth until smooth and shiny. If you wish, add clips at the top to hold paper.



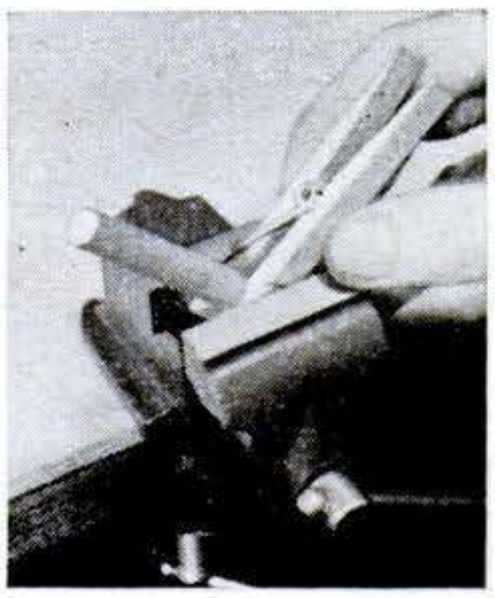
Deflector Stops Spilled Coal

After coal has come in through a cellar window, it is usually necessary to gather up lumps that roll over the floor. A deflector like the one shown in the sketch will save work. When coal is chuted in, it will be deflected beneath the board.—*Victor H. Lamoy, Upper Jay, N. Y.*



Clothespin Grips Dowel

A spring clothespin helps when you want to clamp a small dowel in a vise. Placed between the jaws of the pin, the dowel is held rigidly at any angle for filing, cutting or drilling.—*J. J. Rea, Urbana, Ill.*



No-Scrape Paint Remover

Less elbow grease may be needed to get rid of old paint and varnish with a new remover called Lazy Bill. The noninflammable liquid is brushed on and allowed to work for about 20 minutes. The softened finish is loosened by brushing with steel wool, and then floated off with water. If there are many coats to be removed, more than one application may be necessary. It is manufactured by Davies & Co., Glen Rock, N. J.

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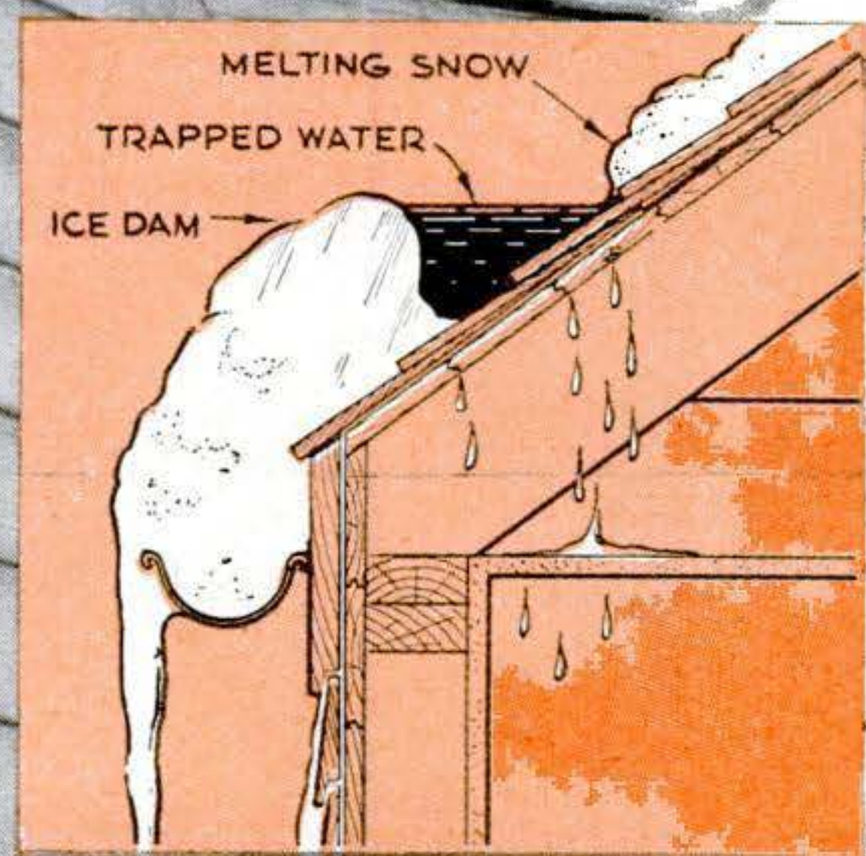
Guarding Against Roof Ice Dams

Take these precautions now to protect your home from damage this winter.

THOUSANDS of homes are damaged every winter in the northern states by ice dams—piles of ice that clog roof gutters. Water from melting snow then drips over the edge, streaking the siding—and worse yet, backs up on the roof itself. These puddles can seep through roof shingles to get inside the house and cause serious damage. You can see the stains on plaster walls and ceilings. What you can't see are the rotting timbers inside the walls.

Wide, overhanging eaves cause the most trouble. Ice often collects on the overhang because it's not warmed—as the roof is—by heat from the attic. Watch valleys, too. Backed-up water may overflow 10″ flashing. There are four plans you can follow to beat this menace:

- Check your roof after a heavy snowfall. Scrape away snow 4′ back from eaves, shovel out valleys.
- Use heating cable (PS, Feb. '49, p. 251) to keep gutters, downspouts and valleys ice-free.
- Lay roll roofing or flashing—if your roof sheathing isn't already covered by roofing paper—to keep water out of the house even when it backs up. You have to take up shingles for about 4′ above the eaves, lay the roll roofing or flashing, and replace the shingles.
- Insulate the attic better. This stops heat from escaping through the roof and thus keeps roof snow from melting in cold weather.—*F. A. Strenge, Madison, Wis.*



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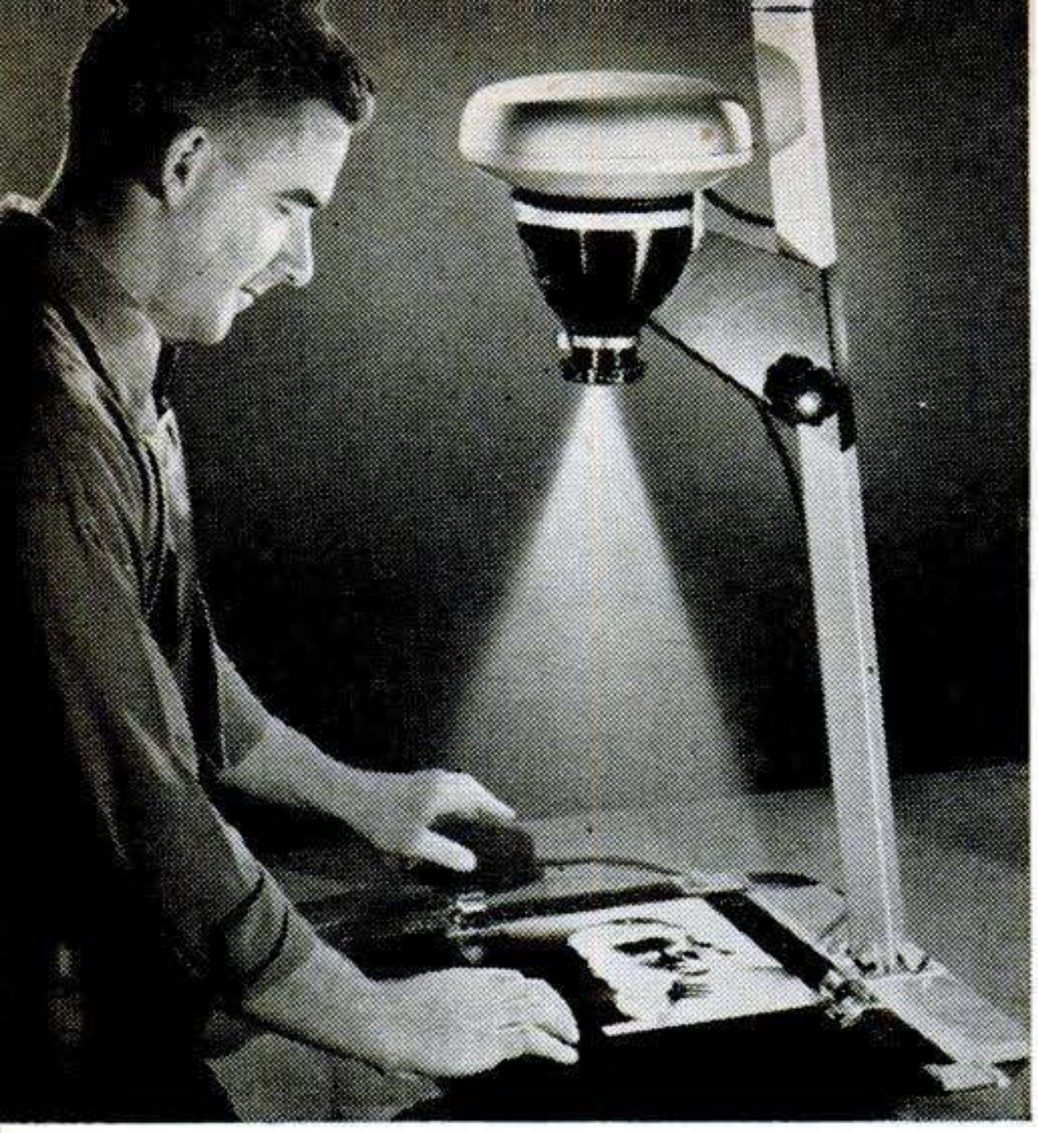

Ideal for beginners—Kodak Hobbyist Enlarger, only $49.50, is offered complete with lens. New cold light protects your negatives—flashes on at the touch of a button attached to the cord. New negative carrier simplifies loading of negatives up to 2¼x3¼ inches. Compact, light, the Hobbyist is ideal for use where space is limited.

HOW TO MAKE DARKROOM DREAMS

Ever daydream about setting up a darkroom? The Kodak equipment shown on these pages can help make those dreams come true. It's such wonderful fun to develop, print, and enlarge your own pictures ... and quite simple, too. And the expense need not be great. Let your Kodak dealer help start you off. Or, if you already have a darkroom, he'll be glad to suggest ways to improve it. His professional knowledge can probably save you time and money in the long run. Be sure to see him soon.

Designed for salon quality—Kodak Flurolite Enlarger gives even, fast, high-contrast illumination with integrating-sphere light source. Focusing and elevating knobs may be used at the same time. Rotary negative carrier for easy loading. Lighttight cabinet in base for paper storage. With accessories, quickly converts to view camera for copying, cine titling, photomicrography. $112.50 (without lens).

New Kodak Enlarging Ektanon Lens, 50 mm. f/4.5, for the "Flurolite" and other enlargers. All elements are Lumenized. Iris-type diaphragm with click stops down to f/16. $15.75

Other Kodak enlarging lenses for the Flurolite range up to Kodak Enlarging Ektar Lens, 4-in. f/4.5, for negatives up to 2¼x3¼. Prices from $25.75

Kodak Masking Easel, 11x14, masks prints up to 11x14 inches, adjusts for ¼- to ¾-inch margins. Design assures right angles, facilitates one-hand loading. $11.25

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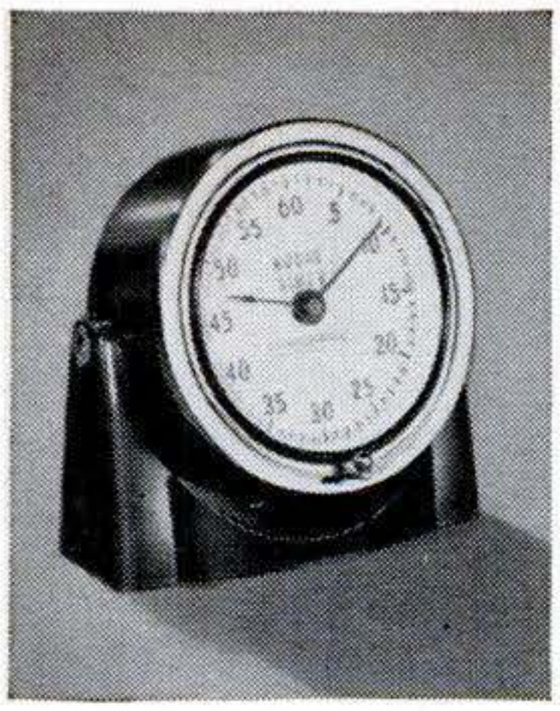


Time your work up to 60 minutes—Kodak Timer with tilting base. "Start-and-stop" switch permits stopping without resetting hands. $6.75

Controls printing time to the second—Kodak Electric Time Control. Automatic, 1 to 57 seconds. Printer or enlarger plugs into control. $13.50

Keep your hands free—Kodak Utility Footswitch leaves your hands free to handle equipment. Safe neon light glows through slots to mark location. $10

A safelight lamp is a "must"—Popular Kodak Adjustable Safelight Lamp above is $8.25; bracket, $.60. (Brownie Darkroom Lamp, Model B, only $1.15.)

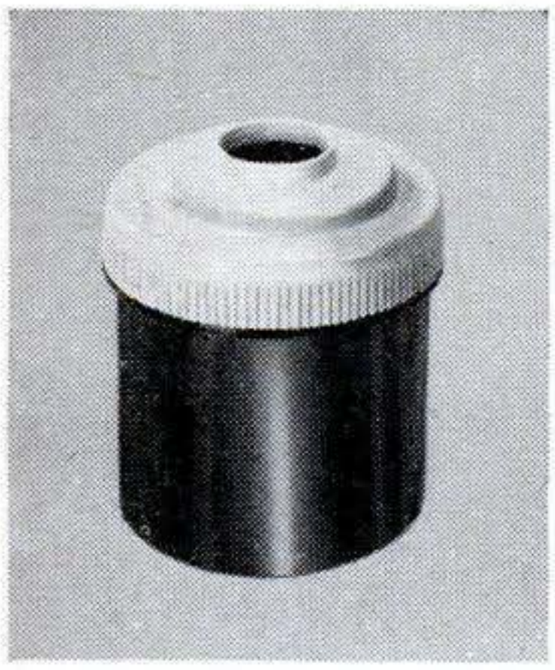
COME TRUE

Dry your prints quickly, without curling—The Kodak Blotter Roll allows for free circulation of air for rapid drying. Capacity —60 prints of average size. $2.75

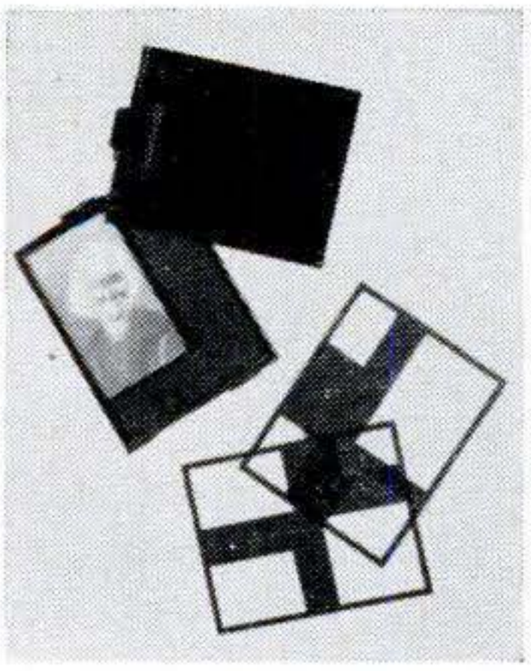
Complete kit for prints, only $4.85—Kodacraft Printing Kit. Trays, printing frame, Velite Paper, chemicals, graduate, thermometer, stirring rod, instruction book.

Everything you need to develop and print—Kodacraft Photo-Lab Outfit includes new Kodacraft Roll-Film Tank, trays, printing frame, chemicals. $8.50

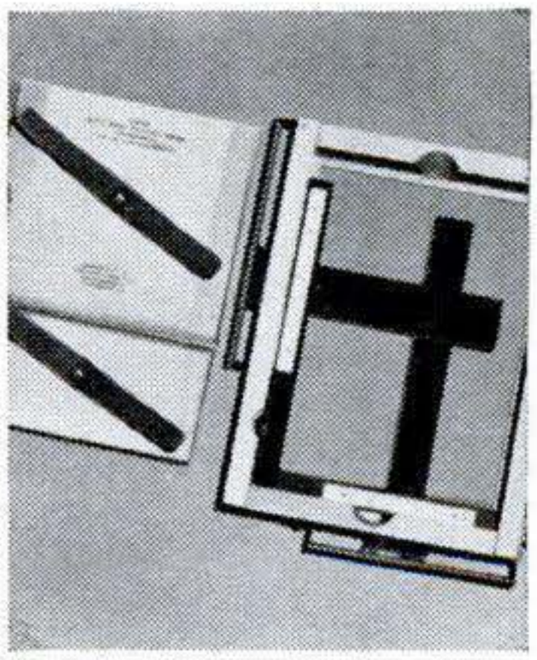
Complete outfit, including metal printer and roll-film tank—Kodacraft Advanced Photo-Lab. Also contains everything else included in kits at left. $13.95



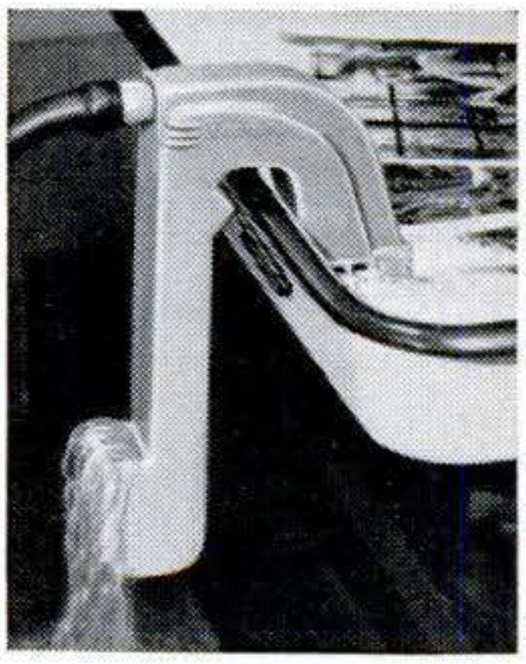
For roll-film developing—Kodacraft Roll-Film Tank. After loading, can be used in lighted room. Takes 620, 120, 616, 116, and 127 films. $2.95



For contact printing—Kodacraft Printing Frame. Includes glass plate, masks for 9 popular negative sizes. Accepts paper up to 4¼x5½ in. $1.50



Takes negatives up to 4x5½ in.—Kodak Auto-Mask Printing Frame. Graduated scales on 2 sides give even margins and serve as paper guides. $3.25



Wash film and prints in tray automatically—Kodak Automatic Tray Siphon attaches to water tap. Water is siphoned out at same speed at which it enters. $5.25

Prices subject to change without notice and include Federal Tax where applicable.

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[Continued from page 198]

thought to himself. "It must be a gallop that sets in only at high speeds."

The tester bore out Gus's analysis. Timing and spark were perfect at idling speeds.

"Okay, now give her the gas for a moment or two, Dale, and let's see what the tester shows. Be ready to shut her off if she starts to shake too badly."

Dale pressed the accelerator gingerly as Gus watched the tester, waiting for the vibrations to begin. But again, there wasn't the slightest sign of trouble.

"I'll be darned," said Stan.

"I'll be jiggered," echoed Silas.

"Gremlins," muttered Dale as he shut off the ignition at a signal from Gus.

Dale Gets the Third Degree

Gus said nothing. He just stood by the open hood thoughtfully. Then he walked around and looked at the starter.

"When did you say you had that new battery installed?"

"Late yesterday afternoon."

"Then what did you do?"

"Drove back here to town and had supper with Uncle Silas."

"Go out last night?"

"No," Dale replied, looking puzzled by Gus's questions.

"So the first time you used the car after driving to your uncle's with the new battery installed was this morning?"

"That's right."

"Okay, let's try her again. My hunch is that she'll vibrate again this time."

Sure enough, after Dale had started it again and began giving it the gas, the engine started to vibrate on its mounts all over again.

"Keep giving her the gas in spurts."

A Bit of Tape Turns the Trick

With the engine shuddering from side to side, Gus buried his head under the hood. Finally his head popped up into view again. "Shut her off."

Then Gus reached into the back pocket of his coveralls, pulled out a roll of tape, and began taping a section of a wire that led to the base of the distributor.

"Dale, I think your troubles are over. Start and stop her a half-dozen times or so and see if she acts up."

There was no doubt that whatever Gus had done he had fixed it. Dale stopped it, started it, accelerated it, idled it. It ran perfectly.

"Okay, take off, young man. Happy landings. Even with 10 hours out for shut-eye and chow you've still got about 26 hours to cover that 800 miles. And don't worry about the charges." Gus winked. "I know your uncle will be glad to take care of that."

Silas Wants His Money's Worth

Young Crawford thanked Gus, shook hands all around and took off in a hurry. He didn't even stop to ask what had caused his trouble.

But not so Silas. "Now look here, Gus Wilson," he said testily after they had waved young Crawford on his way, "if I'm gonna be stuck for this job I think I oughta be told what was wrong and how you fixed it."

"Seems fair enough," said Gus, smiling. "Well, the way I see it three things added up to make Dale's car act the way it did—soft-rubber engine mounts, the fact that that particular make and model of car has a polarity inverter mounted on the starter, and most of all the carelessness of the guy who installed the new battery."

"Humph," grunted Silas. "What's all that mean? And what in tarnation is a polarity inverter?"

"It's a gimmick like an automatic reversing switch. It reverses the flow of six-volt current to the distributor each time the starter works, so that the breaker points don't burn and pit quite so quickly."

Bare Wire Gets Pinched

"Oh. But how could that make an engine prance around like Dale's did?"

"It didn't, but it did account for the fact that the engine would run smoothly one time and not the next. What really caused the trouble was a chafed spot in the insulation on a low-voltage wire leading to the distributor."

"What chafed it?" Silas inquired, peering at Gus over his glasses.

"Well, that wire runs right up beside the battery, and unless I miss my guess the jerk who installed that battery pinched the wire between the battery and the metal battery case when he tightened the hold-down clamps. Then, to save time, he just yanked the wire loose, ripping off a hunk of the insulation."

[Continued on page 244]

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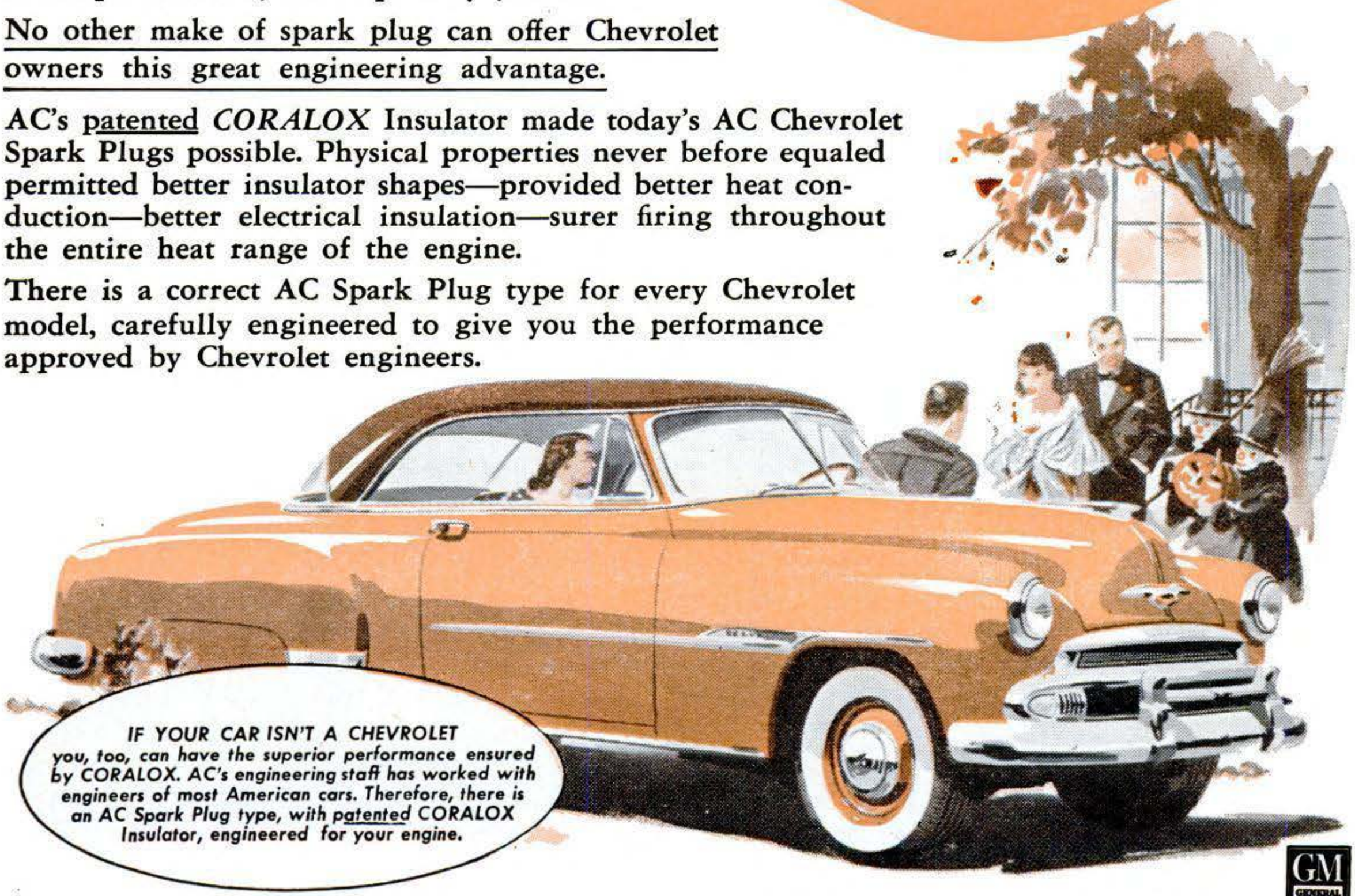

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Gus Gives the Air Force a Lift

[Continued from page 242]

Gus went on to explain how when the engine was idling everything was fine, but when it was speeded up the initial torque tilted the engine just enough on its rubber mounts to bring the bare wire in contact with the metal battery holder. That would short out the distributor, the engine would sputter, lose torque, return to its normal position, break the short and pick up again. Then the whole cycle would repeat itself, causing the engine to rock violently.

"Well, where does this here polarity reverser or whatever it is come in?" Silas wanted to know.

Gus Makes Everything Clear

"Here, I'll show you." Gus drew a couple of rough diagrams on a scrap of paper. "What I just described only happened on every other start when the polarity inverting switch was in the position that made the wire with the bare spot the positive and live lead to the distributor.

"Naturally, when the switch made the wire the ground wire, the car ran okay even when the bare spot touched the battery holder. You can't short out a grounded wire."

"Now, about that damaged wire," said Silas, with a crafty gleam in his eye, "suppose you could prove the battery people caused all this trouble?"

"Sorry, Silas, but I'm not conniving with you in any schemes to get a rebate. Uh-uh. You bargained for a bargain and you got stuck with it."

Silas Gets a Bargain at Last

"How much you gonna soak the old tightwad?" asked Stan when Barnstable, grumbling as usual, had left.

"Oh, just the usual labor charge plus a tow. That ought to add up to enough to give young Crawford a nice Saturday night off the base."

"You mean you're going to send the money to him?"

"You guessed it," said Gus. "It'll be Silas' first contribution to the Armed Forces. I'll tell Crawford it was worth it to me to teach the old nickel-nurser a lesson." Gus grinned. "And for once Silas will really be getting his money's worth . . . Is there any better bargain today than American freedom?" END

Next month: Gus gets the Christmas trees through.

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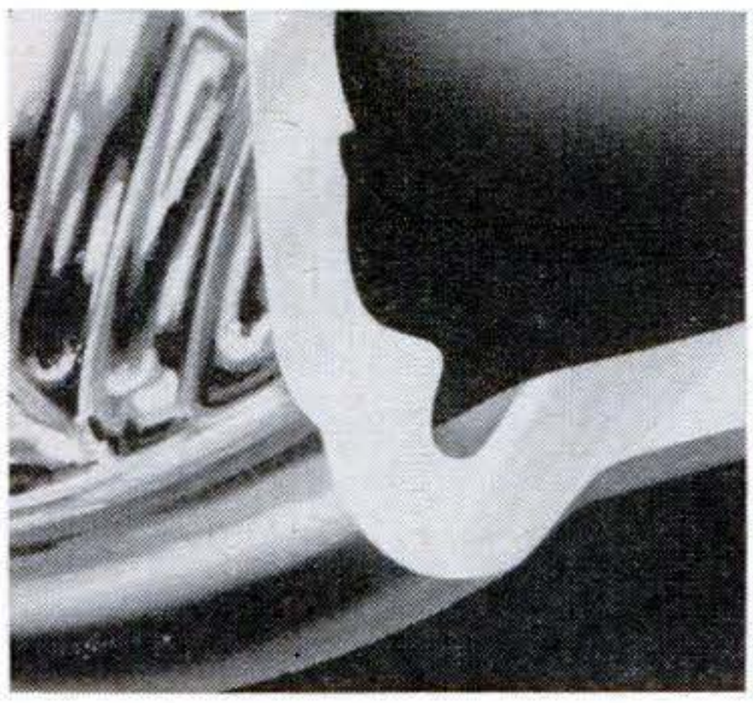

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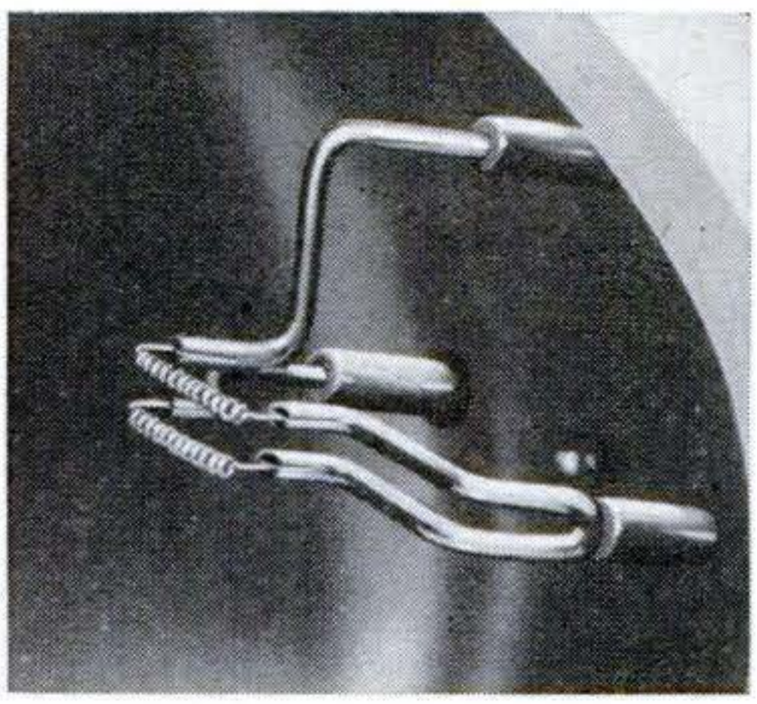

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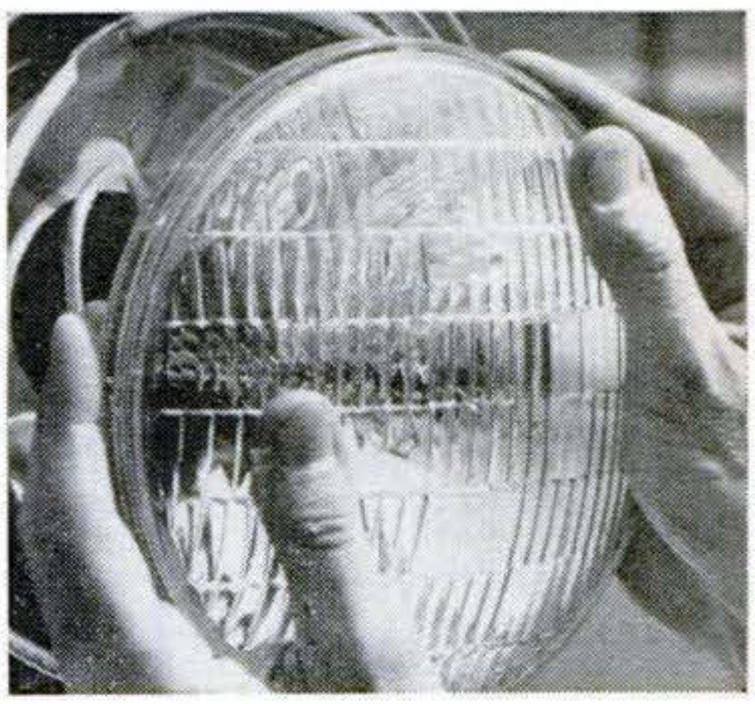

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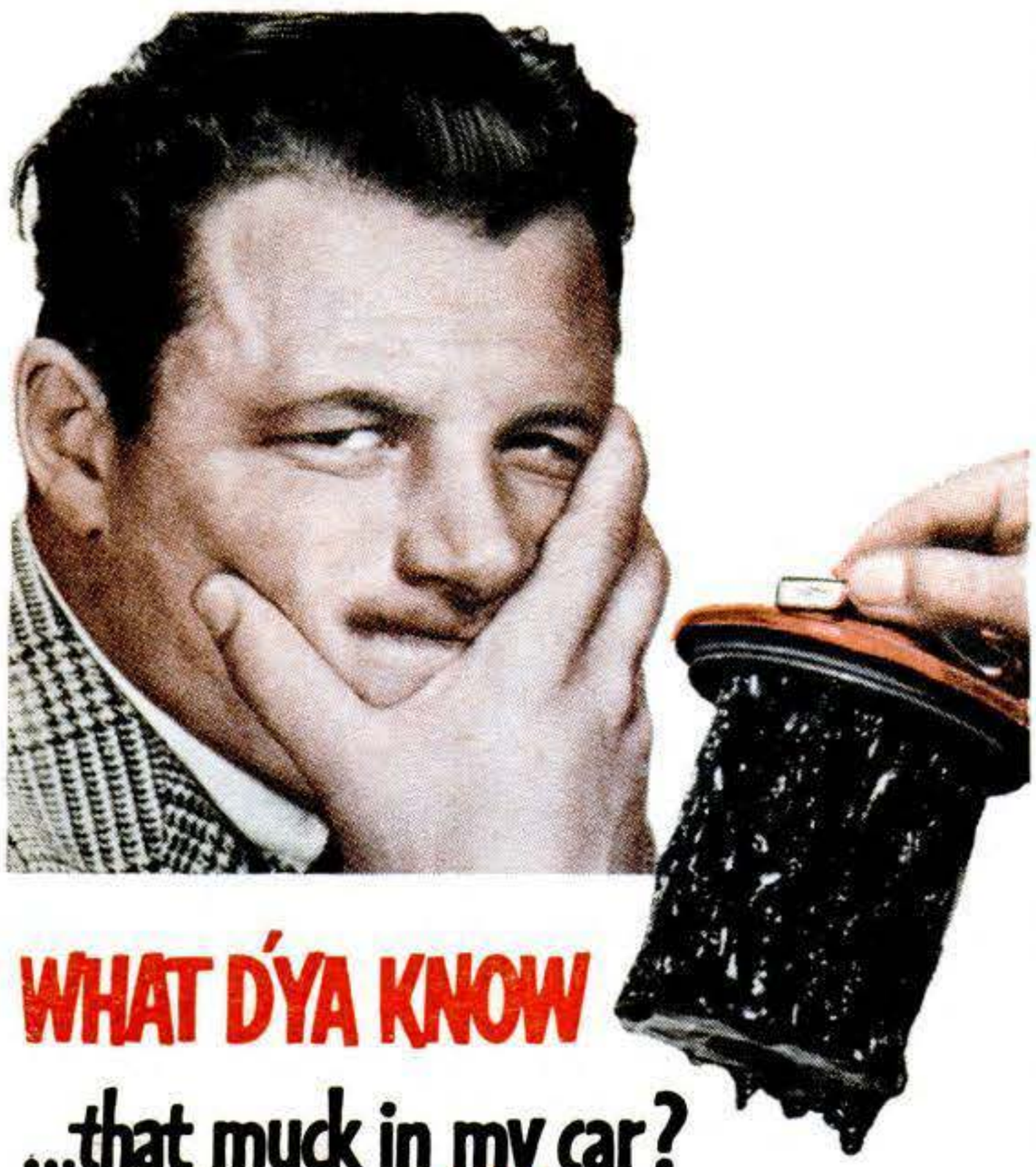

WHAT D'YA KNOW

...that muck in my car?

A mucked-up oil filter can cost you plenty in engine repairs. Get in a new Purolator* Refill—quick!

Checked your oil filter lately? Chances are it looks like this . . . is so clogged up it can't trap all the engine-wrecking abrasives that seep into your oil. Your car may be headed for some costly repairs.

What to do? Don't delay—get in a clean filter refill—fast. **Which make?** Pays to buy the best—a Purolator Micronic*. New accordion-type design gives up to 10 times the filtering area—with pores so tiny they trap particles you can't even see. **Cost much?** Strictly small change—$1.38 to $3.00 depending on car make. Purolator Products, Inc., Rahway, N. J.; Toronto, Ontario, Canada.

*Reg. U.S. Pat. Off.

PurOlator

MICRONIC

OIL FILTER

Right you are—it's **JACK CARSON,** now starring in "MR. UNIVERSE"

New Poison Fools Rats

[Continued from page 204]

rats that the manufacturer restricts its sale to professional exterminators and government agents.

Besides using warfarin and other poisons, a man ridding a place of rats must follow principles of sanitation (keep garbage in a closed can, pick up piles of lumber in yard, etc.), and must ratproof his buildings. He can also trap rats. These steps keep rats from food and shelter.

Rats Destroy Each Other

Deprived of shelter, rats will migrate and fight and kill each other. Deprived of food, they will fight, kill, and eat each other; they will starve, and perhaps die; they will be forced to take poisoned bait more quickly and in greater quantity.

It is possible, according to Dr. Harold Gunderson, of Iowa State College, to tell how bad a particular rat problem is. If you see gnawed food, torn sacks, or the long, dark streaks across a floor that indicate a rat runway—but never see a rat—chances are there are from one to 100 rats around.

They Multiply Like Rabbits

If you see a rat occasionally at night, there are probably 100 to 500. If you see rats each night and sometimes by day, there are probably 500 to 1,000 in the vicinity. If you see many at night and several every day, there are likely to be 1,000 to 5,000 on hand.

No matter how big a rat problem a man has, he now has a chance to lick it and keep it licked. The rat's natural enemies—cats, dogs, owls, hawks, skunks, snakes, mongooses and ferrets—have never been able to stop the increase of rats because the rats multiply too fast. Sexually mature before they are grown, they have six to eight litters a year with six to 14 in each litter. That is why we have more than 155,000,000 rats in the U. S. END

Water Flea Used as "Guinea Pig"

THOSE tiny water fleas, nymphs, and larvae that abound in rivers and streams are now being used as "guinea pigs" to determine the polluting effects of industrial wastes on fish life. Dr. Charles E. Renn of Johns Hopkins University studies the effects of various poisons on the tiny animals, which are the food on which fish live.

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. . . but before you put in anti-freeze, have your cooling system checked and serviced

Cooling System Specialists
CARE WILL SAVE YOUR CAR

Go to an expert. The dealer who displays this emblem offers you a *special* winter service. Make a date with him early for anti-freeze and for a thorough cooling system check-up before the anti-freeze rush jams his driveway.

*Reg. U. S. Pat. Off.
†O.P.S. Retail Ceiling Price

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BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

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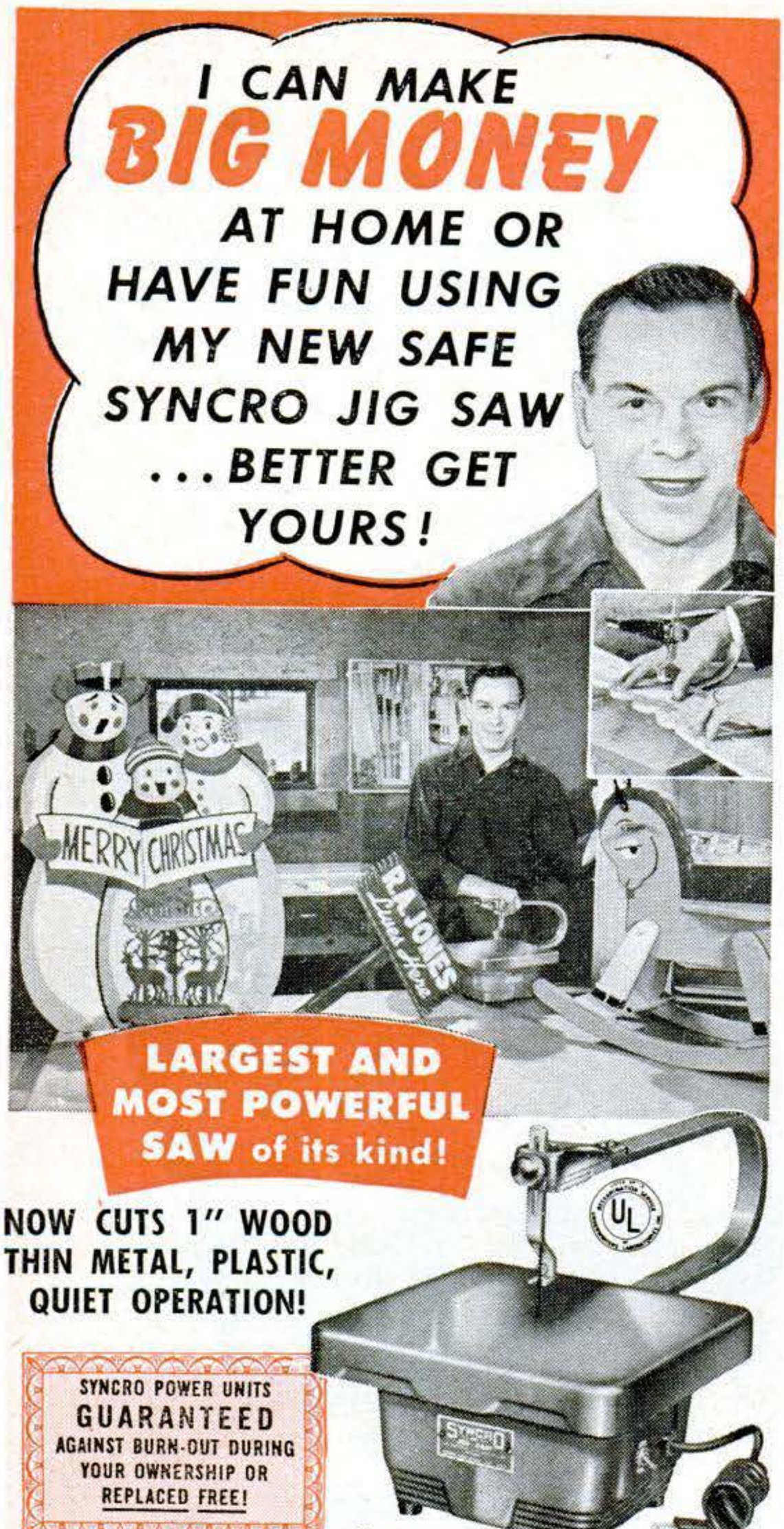
BIG MONEY
AT HOME OR
HAVE FUN USING
MY NEW SAFE
SYNCRO JIG SAW
...BETTER GET
YOURS!



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You, too, can use this amazing new, safe jig saw for fun or profit! Make your own Gifts or to sell! SYNCRO SAW is the most powerful, largest of its kind! QUIET, ideal for apartments. SAFE, blade does NOT pull fingers toward it. NO belts, gears or oiling. Adjustable "any length cut" arm. With BUILT-IN New Reactance Type Electric Motor. $22.95 at dealers or postpaid. World's largest manufacturer of reciprocating electric sanders with double arc motion which gives double the sanding action.

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☐ ORDER. I enclose $22.95. Send No. 201 Saw postpaid on 10-Day Money Back Trial.

☐ FREE CIRCULAR. Send new SYNCRO CIRCULAR showing amazing new SAW and amazing NEW SANDER.

WRITE NAME, ADDRESS BELOW — MAIL TODAY!

Portable Machines Build Houses Fast

[Continued from page 139]

no longer need four or five men and a stout tree trunk. A Greenlee pipe bender does the job. It is powered hydraulically through a gasoline motor or a hand-operated pump.

The ½-inch electric drill, equipped with a wood auger, a pipe bit, or a hole saw, bores the pipe-holes for plumbing or conduits. An automatic machine threads the pipe. An electric stapler fastens building paper to studs. The electric shaper cuts moldings. The electric plane trims doors and windows to exact dimensions. A routing jig places hardware on doors.

New Tools Constantly Appear

Power helps finish the 1951 house, too. Sanders rough- and smooth-finish almost everything—floors, concrete, wallboard, trim, cabinets, plastics, plywood, masonry, plaster—10 times faster than by hand. Some sanders weigh five pounds and can be operated with one hand. Some will work on flat, curved, vertical, horizontal or overhead surfaces. The floor edger finishes corners, stairs and closets that the floor sander can't reach. The ½-inch electric drill or the electric hammer drills masonry—to fasten fuse boxes, anchor furring and install awnings. The tuck pointer cleans up joints in new masonry. The handyman's ¼-inch electric drill and his 5-inch sander-polisher help on shelving, cupboards, counters. The paint sprayer finishes off the decorating.

New power tools for home building are constantly appearing. The plaster pump sprays plaster from a hopper onto a wall or straight up onto the ceiling.

A really different tool is the cartridge-powered stud driver (PS, Aug. '51, p. 143). It uses a .32-caliber cartridge to shoot a file-hard steel stud into almost any kind of structural material, even steel and concrete.

Rented Tools Save Owner Money

The present building boom and the high cost of labor have both helped spark the power-tool revolution. And something else fundamental is happening to spread the revolution: through lumberyards, hardware stores and paint stores you can rent the tools for a few hours, for a few days or for a whole house-building job.

Speed, availability, work saving—all these characteristics of power tools make it possible for the owner himself to do more work than ever upon a new home. END

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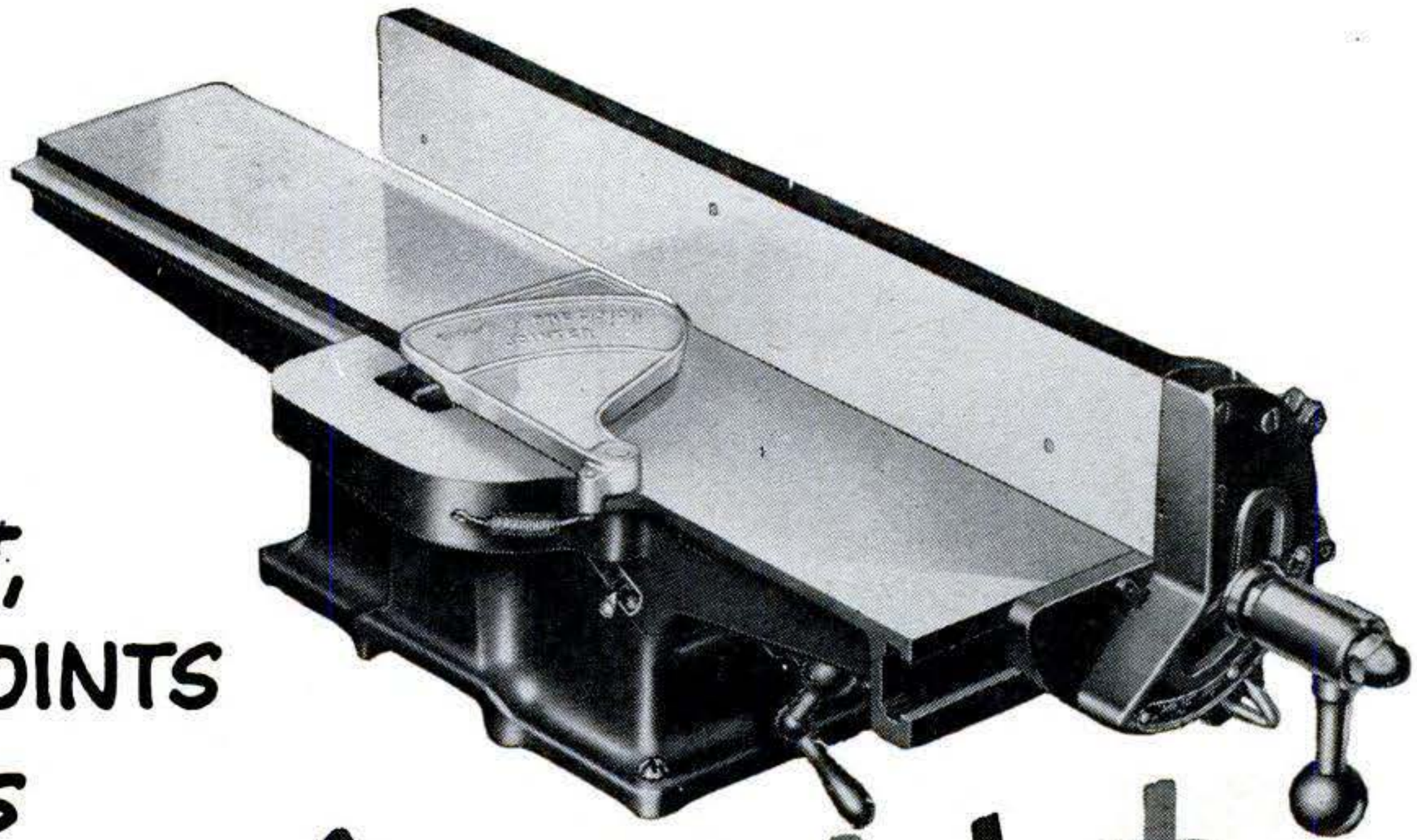
PLANE TRUE, STRAIGHT, SQUARE JOINTS



WITH THIS DELTA 4-inch Jointer

☆ ***Adjustable front and rear tables***
☆ **ONE *control to slide and tilt fence***

You can do real quality joining speedily, easily and safely with this remarkable tool—the finest ever offered for home workshops.

Check over these excellent practical features that mean more accuracy and greater satisfaction with the Delta 4-inch Jointer.

- **it's a big, husky machine**
- **three knives are held in a specially balanced revolving head which runs on lubricated-for-life ball bearings**
- **knives are precision-ground to match and balance**
- **fence is rigid and heavy—*no deflection;* can be moved entire width of table**
- **fence tilts 45° in either direction—automatic, stops at 45°, 90° and 135° from table**
- **tables are finish-ground to assure perfect line-up, and are individually adjustable**
- **super-safe guard covers knives**
- **tables raise and lower on V-ways, with adjustable gibs to take up for wear.**

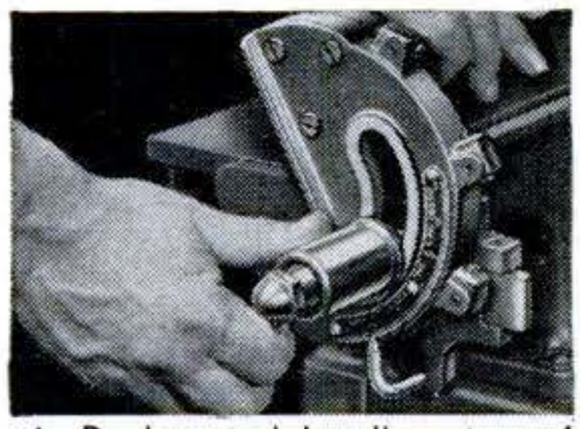
See this fine Delta Tool at your nearest Delta dealer; and send for the valuable free book "How to Start Your Homeworkshop"—scores of pictures, ideas, helpful suggestions. Use the coupon.

There's a Delta Tool for Your Job-

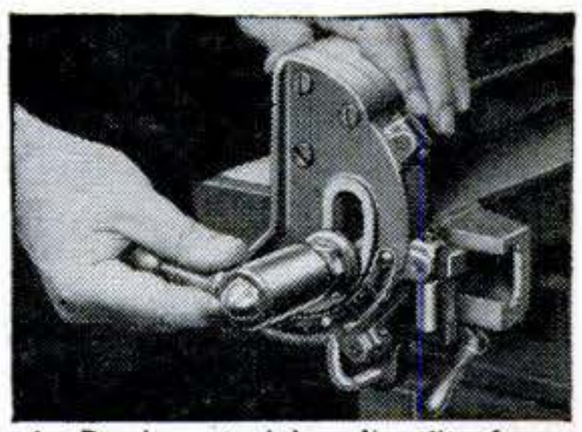
WOOD OR METAL WORKING

53 MACHINES 246 MODELS

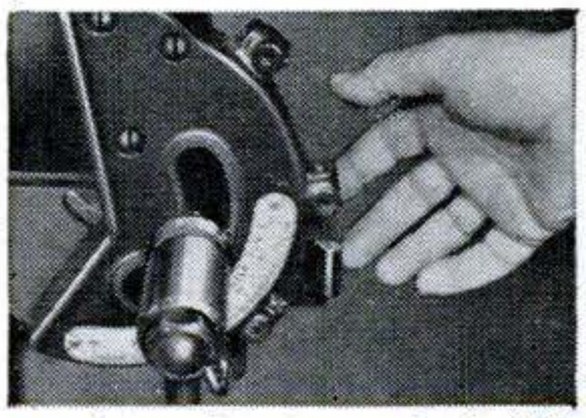
MORE THAN 1300 ACCESSORIES



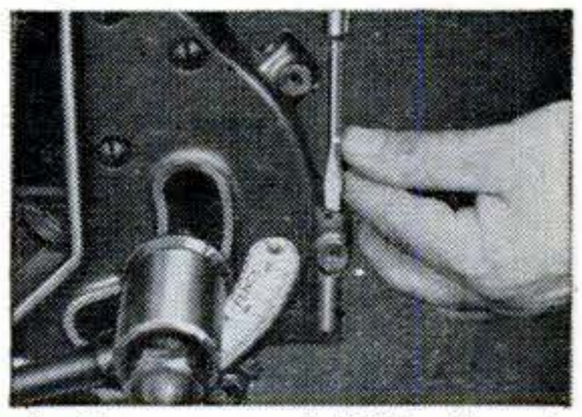
☆ Dual control handle sets and **securely locks fence in any position across table**



☆ Dual control handle tilts fence **and securely locks it to any angle desired**



☆ Automatic stops set at 45°, 90° and 135°; large scale for accurate settings



☆ Stop screws individually adjustable for absolute accuracy; fence will always automatically stop at setting.

DELTA MILWAUKEE

DELTA POWER TOOL DIVISION

Rockwell

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☐ Please send me the "How to Start Your Homeworkshop" book.
☐ Please send me the name and address of the nearest Delta dealer.

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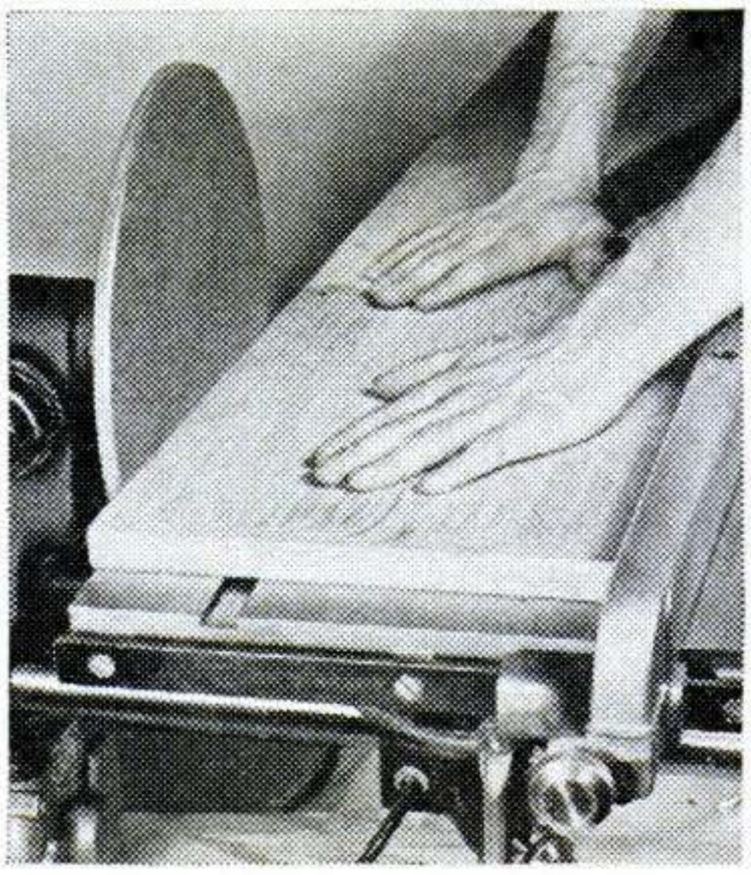

1 ***"Big-job capacity.*** I don't know of any other 8-inch saw that matches the capacity of SHOPSMITH. The table extension gives you a working area 17" x 54". Sawing long boards and 4' x 8' plywood panels is a *one*-man job."

2 ***"Smoothing edges*** with the disc sander is a SHOPSMITH exclusive. It's done by setting the rip fence at a slight angle to the disc. Work fed between fence and disc is jointed to precise widths. The big, tilting table gives plenty of support."

3 ***"Perfect doweling*** is possible with SHOPSMITH in the horizontal drill press position. Work is laid flat on the table and backed up by the rip fence. Drill is fed in from the side. Ball and crank table-raiser accurately adjusts table height."

See SHOPSMITH demonstrated at leading hardware and department stores or any Montgomery Ward store. FREE! 16-page information-packed catalog. Gives details and specifications on SHOPSMITH and accessories. Write for it.

Basic SHOPSMITH includes all attachments for . . .
8" circular saw • 15" drill press
12" disc sander • Horizontal drill
33" wood lathe

5-tool unit complete except for motor* $189.50

**Special 1/2-hp., capacitor-type motor, $34.50*

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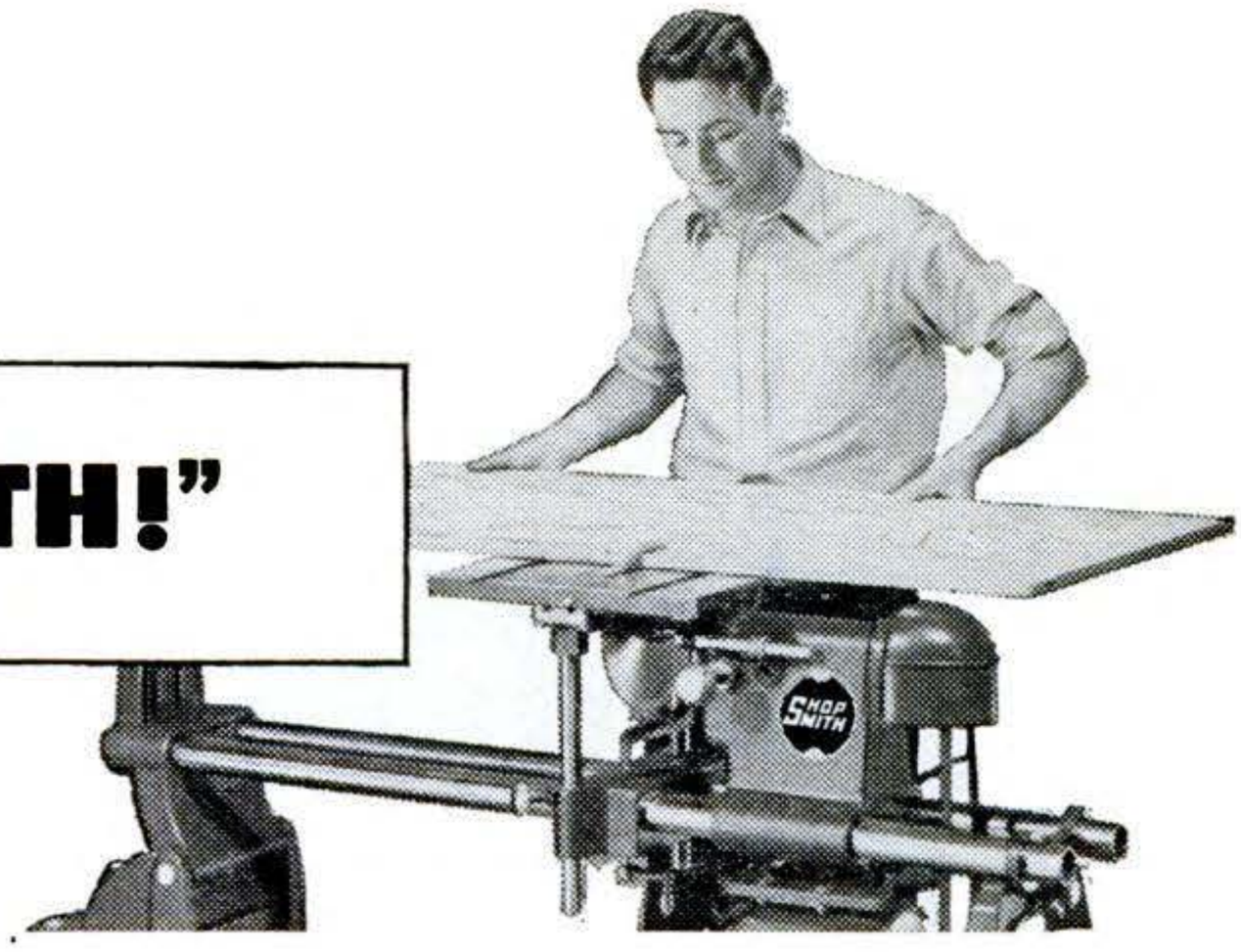
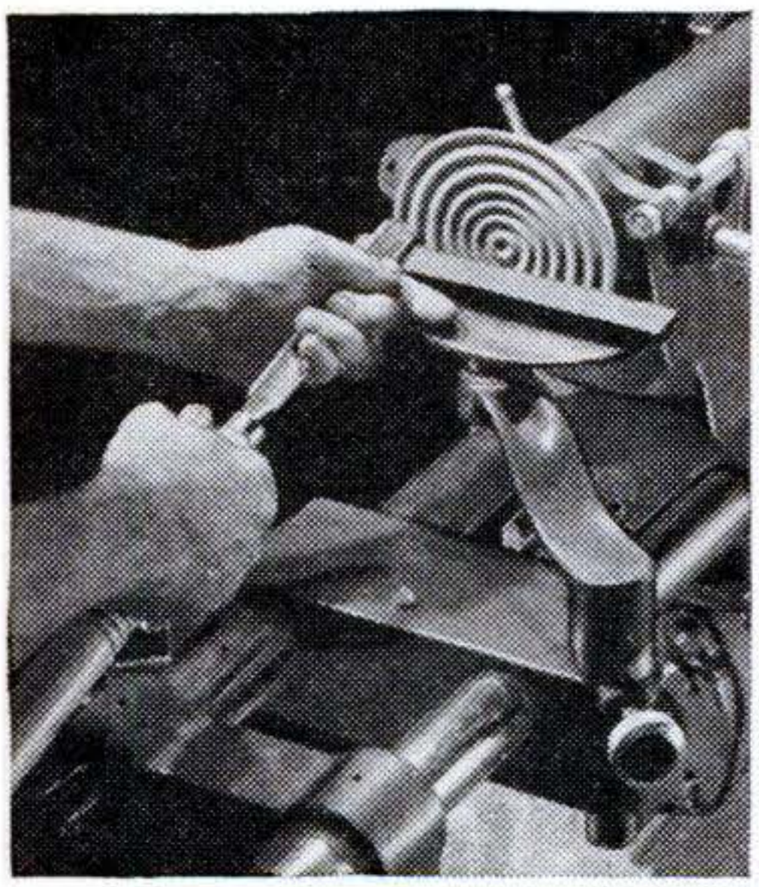


"A built-in wardrobe cabinet was my first real SHOPSMITH project. And what an eye-opener it was! I never realized that SHOPSMITH could do so much in so many different ways in such limited space.

"I like the way SHOPSMITH converts quickly and easily from saw to disc sander to wood lathe to horizontal and vertical drill press. I like the way it's made—four ball bearings, heavy castings, precision-fitted parts. Best of all, I like its flexibility and the fact that, in each of its five positions, it has features you won't find in any other power tools. Simplified micro-adjustments and convenient, ready-to-use jigs, for example.

"In making the cabinet, I found that no job was too big, too difficult, or too unusual for my SHOPSMITH. Being able to use the right tool the right way saved me hours of time. And the accuracy I got was mighty satisfying. It was a big job, but SHOPSMITH made it easy!"



4 ***"Face to face.*** SHOPSMITH is the only lathe that lets you face your work while turning knobs, bowls or other flat or hollow objects. The full-swivel tool rest makes it easy to get into and behind faceplate turnings. Lathe has 15" swing, 33" capacity."

5 ***"Tall trimming.*** I needed to trim 3" off the side of the doors for the wardrobe. So I set SHOPSMITH in the vertical saw position and used the floor as a fence guide. It was a lot faster than hand sawing—and far more accurate."

6 ***"Built-in jig.*** When it came to drilling dowels for the drawer pulls, SHOPSMITH again showed its flexibility. The fence and tilting table formed a V-block for holding the dowel accurately. SHOPSMITH as a drill press is second to none!"

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If it's a JACOBS
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Jacobs Rubber-Flex Hex-Key Chucks on home workshop power tools prove that their makers put quality first.

Jacobs Plain Bearing Key Chucks . . . the most widely used drill chuck in the world.

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IF IT'S A
JACOBS
IT HOLDS

The Jacobs Manufacturing Company
West Hartford 10, Connecticut

Why Our Winters Are Getting Warmer

[*Continued from page 117*]

are also rhythmically occurring periods that fall at varying intervals—for example, every nine, 18, or 36 years. These correspond to other tidal cycles. They produce climatic variations of shorter periods and of less drastic nature.

Fish Failed and Ships Sank

The year 1903, for instance, was memorable for its outbursts of polar ice in the Arctic and for the repercussions on Scandinavian fisheries. There was "a general failure of cod, herring and other fish along the coast from Finmarken and Lofoten to the Skagerrak and Kattegat. The greater part of the Barents Sea was covered with pack ice up to May, the ice border approaching closer to the Murman and Finmarken coasts than ever before. Herds of arctic seals visited these coasts, and some species of the arctic whitefish extended their migrations to the Christiana Fiord and even entered into the Baltic."

This outbreak of ice came in the year when earth, moon and sun were in a relative position that gives a secondary maximum of the tide-producing forces. The similar constellation of 1912 was another great ice year in the Labrador Current—a year that brought the disaster of the *Titanic.*

Now in our own lifetime we are witnessing a startling alteration of climate, and it is intriguing to apply Otto Pettersson's ideas as a possible explanation.

It is now established beyond question that a definite change in the arctic climate set in about 1900, that it became astonishingly marked about 1930, and that it is now spreading into subarctic and temperate regions. The frigid top of the world is very clearly warming up.

Ships Sail Farther North

The trend toward a milder climate in the Arctic is perhaps most strikingly apparent in the greater ease of navigation in the North Atlantic and the Arctic Sea. In 1932, for example, the *Knipowitsch* sailed around Franz Josef Land for the first time in the history of arctic voyaging. And three years later the Russian ice-breaker *Sadko* went from the northern tip of Novaya Zemlya (Northern Land) to 82°41′ north latitude—the northernmost point ever reached by a ship under its own power.

[*Continued on page 254*]

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See, Try, and Compare Westcraft Tools... Discover How Little Fine Tools Can Cost!

Join the thousands who have discovered that famous, professional quality Westcraft tools give you the same precision engineering and lasting accuracy of other brands costing considerably more. Before you buy **any** tools, see how much more you get by shopping the complete line of guaranteed Westcraft tools . . . yours on easy terms at Western Auto!

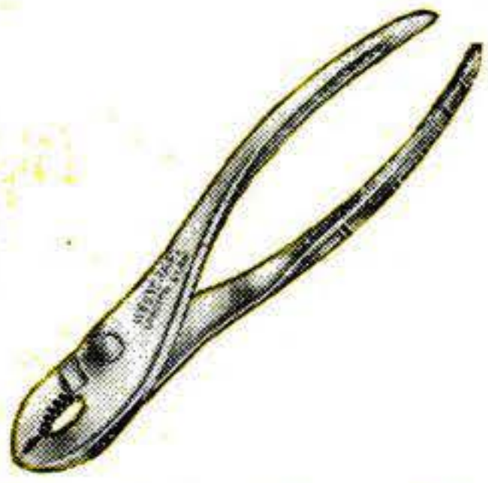
(1) **Tilt Table Jig Saw,** cuts to center of 24" circle. Scotch yoke, oilite bearings. Uses 5" pin or plain end blade.....(2J1102) **$20.80**

(2) **17-pc. Socket Set,** ½" Sq. Drive. Alloy steel chrome plated. 12 sockets, reversible ratchet, 5 fittings.....(HR2951) **$19.45**

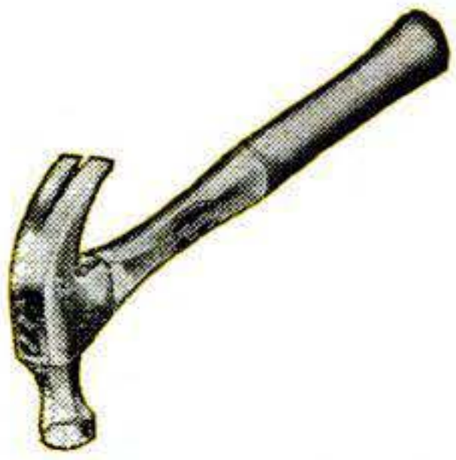
(3) **Hacksaw,** chrome-plated adjustable steel frame. Cuts 3⅜" deep. Safety grip plastic handle with 10" blade.....(4HR4159) **$2.25**

8-Point Crosscut Saw, 26", 4-gauge double tapered blade. Precision tempered...(4HR6329) **$4.79**

Screwdriver, alloy steel, chrome-plated, 4" square blade. Positive-grip handle.....(HR1361) **89¢**



7" Lobster Claw Plier. Patented design gives 50% more gripping power.....(HR1125) **$1.29**



Claw Hammer, 16-oz. Full polished. Tempered claws and head. Hickory handle.....(4HR6125) **$3.15**

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Why Our Winters Are Getting Warmer

[*Continued from page 252*]

In 1940 the whole northern coast of Europe and Asia was remarkably free from ice during the summer months, and more than 100 vessels engaged in trade via the arctic routes. In 1942 a vessel unloaded supplies at the west Greenland port of Upernivik (latitude 72°43′N) during Christmas week "in almost complete winter darkness." During the Forties the season for shipping coal from West Spitsbergen ports lengthened to seven months, compared with three at the beginning of the century. The season when pack ice lies about Iceland became shorter by about two months than it was a century ago. Drift ice in the Russian sector of the Arctic Sea decreased by a million square kilometers between 1924 and 1944, and in the Laptev Sea two islands of fossil ice melted away completely, their position being marked by submarine shoals.

Birds and Fish Move Poleward

Activities in the nonhuman world also reflect the warming of the Arctic—the changed habits and migrations of many fishes, birds, land mammals and whales.

Many new birds are appearing in far northern lands for the first time in our records. Some high-arctic forms, which thrive in cold climates, have shown their distaste for the warmer temperatures by visiting Greenland in decreasing numbers.

As the chill of the northern waters has abated and the fish have moved poleward, the fisheries around Iceland have expanded enormously, and it has become profitable for trawlers to push on to Bear Island, Spitsbergen and the Barents Sea. These waters now yield perhaps two billion pounds of cod a year—the largest catch of a single species by any fishery in the world. But its existence is tenuous. If the cycle turns, the waters begin to chill, and the ice floes creep southward again, there is nothing man can do that will preserve the Arctic fisheries.

Glaciers Are Receding

The recession of the northern glaciers is going at such a rate that many smaller ones have already disappeared. If the present rate of melting continues others will soon follow them.

The melting away of the snow fields in the Opdal Mountains in Norway has exposed wooden-shafted arrows of a type used about

[*Continued on page 256*]

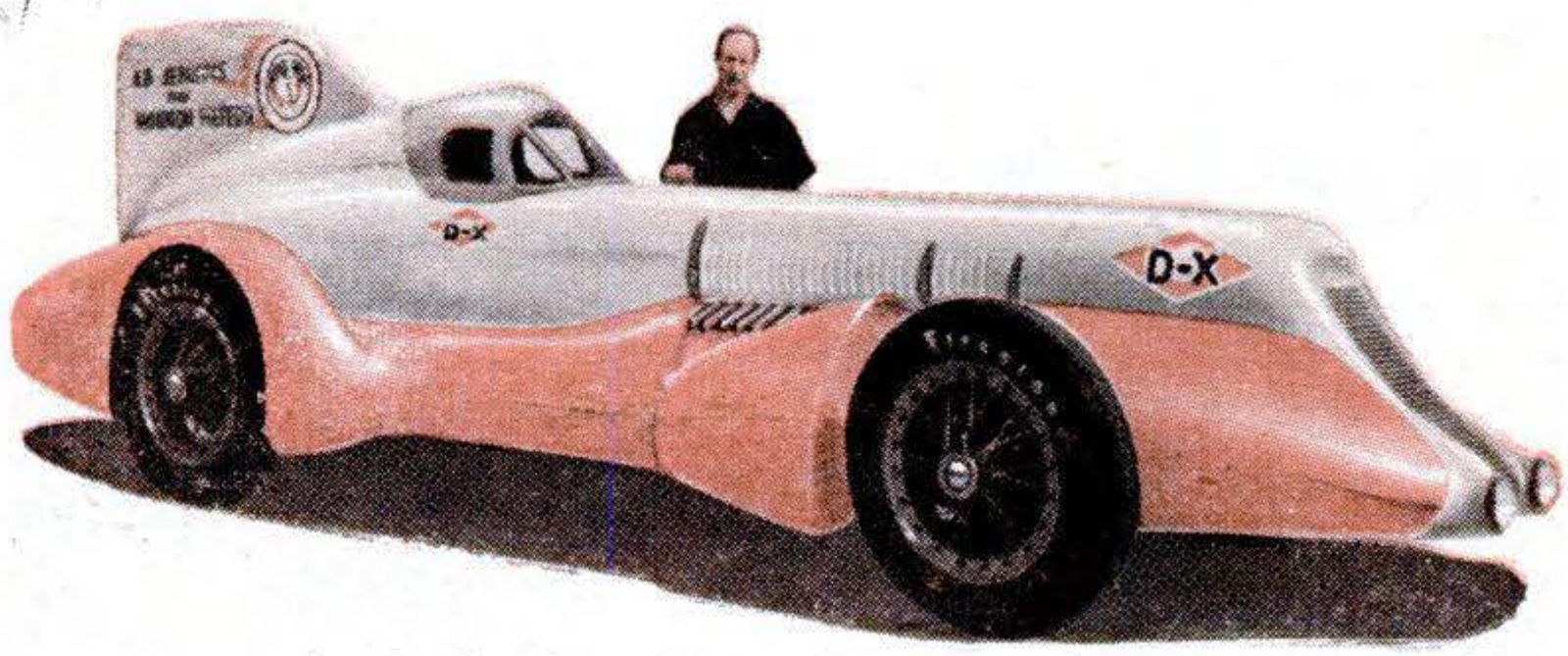
WORLD'S SPEED KING

Tells Why He Recommends

Champion Spark Plugs

for Every Engine!

AB JENKINS,
World's Speed King and former Mayor of Salt Lake City, Utah



As the holder of more World and American speed records than any other man, I believe I can speak with authority on spark plugs. In over 30 years of racing against the clock you acquire a lot of practical knowledge about the equipment that will give you top performance and dependability. At 200 miles per hour my spark plugs take more of a beating in an hour than the spark plugs in your car do in over a year's normal driving. From my own experience Champion Spark Plugs have no equal and I've tested them all. I hold hundreds of American and World speed records and just recently added 24 new ones, all made with Champions. I unqualifiedly recommend Champion Spark Plugs. Ab Jenkins

CHAMPION SPARK PLUG COMPANY, TOLEDO 1, OHIO

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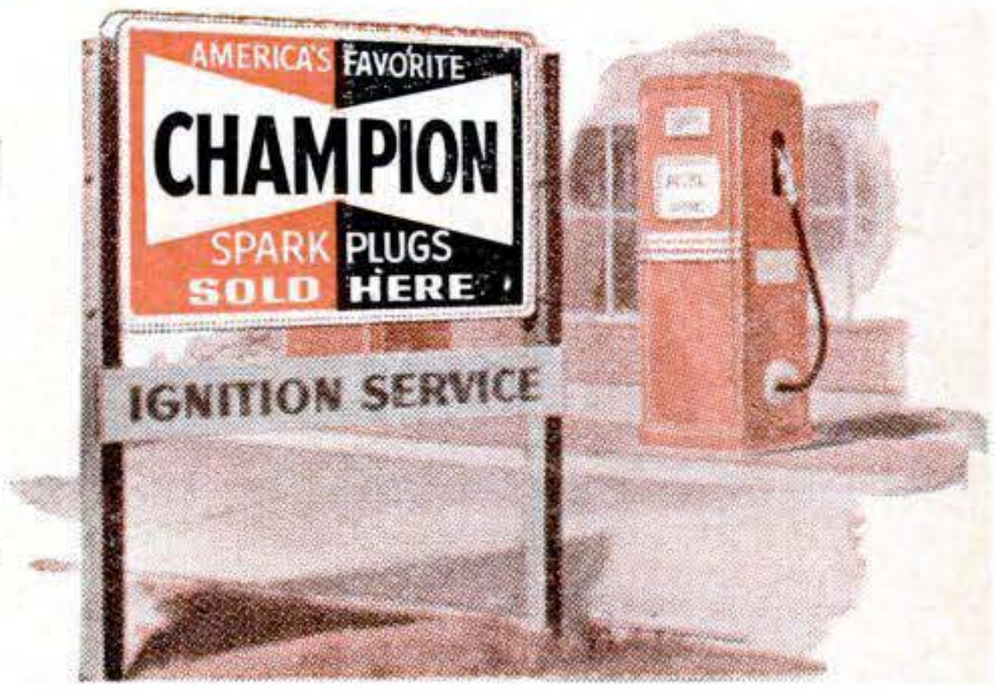
DEMAND DEPENDABLE CHAMPIONS FOR YOUR CAR



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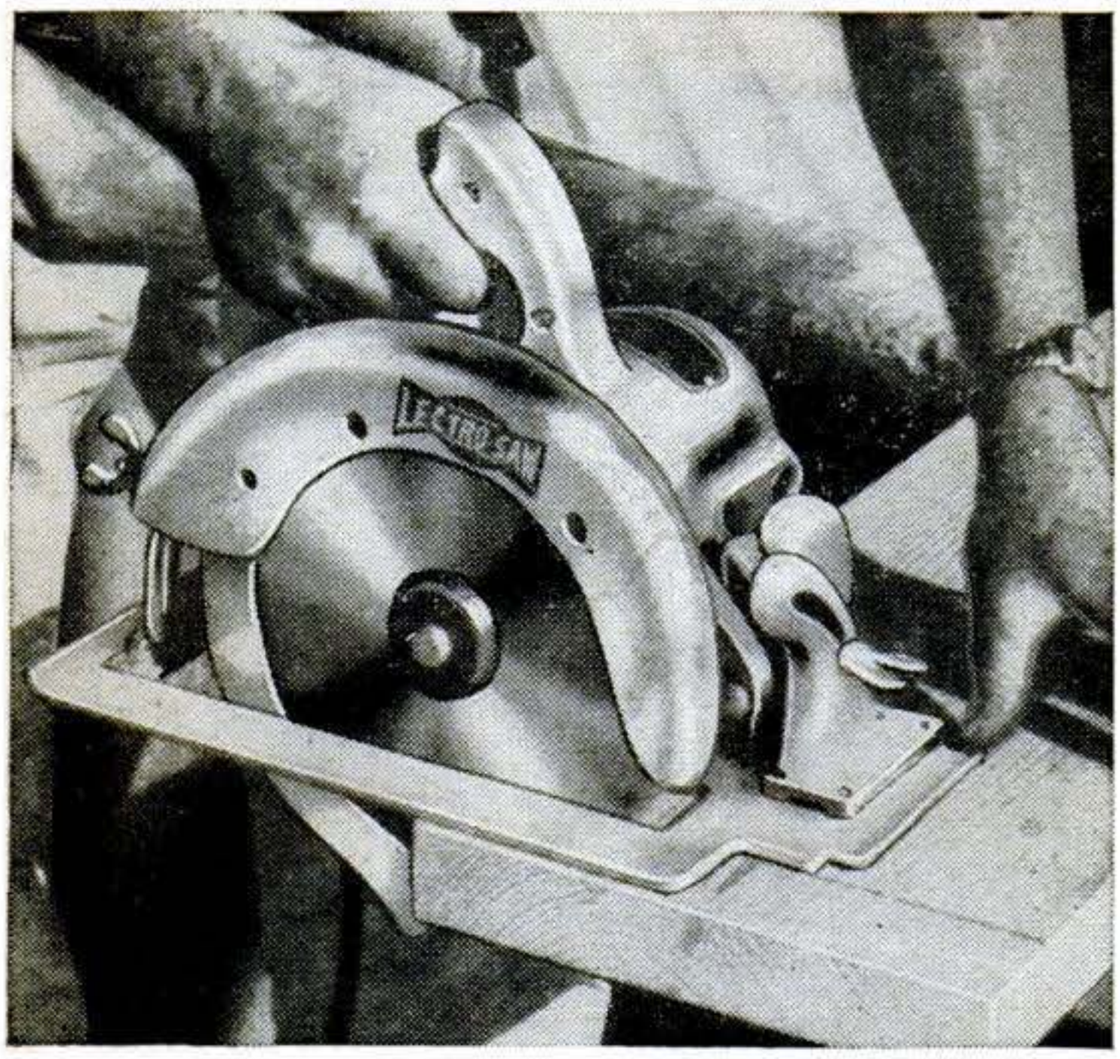

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EASY HANDLING! Handle-to-blade dimension held to minimum for easy control; handle close to center of gravity for good balance.

FAST ADJUSTMENT! Depth and bevel of cut easy to change; dual depth adjustments keep wrist position comfortable at any depth cut.

FULLY SAFEGUARDED! Telescoping blade guard. Instant release trigger switch. Correctly positioned saw-grip handle.

LOW PRICES! 8″ Heavy-Duty, cuts to 2 13/16″ depth, $92.50; 6″ Deluxe Heavy-Duty, cuts to 2″ depth, $76.50; 6″ Heavy-Duty, cuts to 2″ depth, $56.50.

BLACK & DECKER

ELECTRIC LECTRO-SAW SAWS

THE BLACK & DECKER MFG. CO.,
Dept. H11S, Towson 4, Md.

Why Our Winters Are Getting Warmer

[Continued from page 254]

A.D. 400 to 500. This suggests that the snow cover in this region must now be less than it has been at any time within the past 1,400 to 1,500 years.

The glaciologist Hans Ahlmann reports that most Norwegian glaciers "are living only on their own mass without receiving any annual fresh supply of snow"; that in the Alps there has been a general retreat and shrinkage of glaciers during the last decades, which became "catastrophic" in the summer of 1947, and that all glaciers around the North Atlantic coasts are shrinking. The most rapid recession of all is occurring in Alaska, where the Muir Glacier receded about 10½ kilometers in 12 years.

The milder arctic and subarctic climate seems already to have resulted in longer growing seasons and better crops. The cultivation of oats has improved in Iceland. In Norway good seed years are now the rule rather than the exception, and even in northern Scandinavia the trees have spread rapidly above their former timber lines, and both pine and spruce are making a quicker annual growth than they have for some time.

The World Is Warming Up

The countries where the most striking changes are taking place are those whose climate is most directly under the control of the North Atlantic currents. Greenland, Iceland, Spitsbergen and all of northern Europe, as we have seen, experience heat and cold, drought and flood in accordance with the varying strength and warmth of the eastward- and northward-moving currents of the Atlantic.

It is interesting to calculate where our twentieth-century situation fits into the cosmic scheme of the shifting cycles of the tides. The great tides at the close of the Middle Ages, with their accompanying snow and ice, furious winds and inundating floods, are more than five centuries behind us. The era of weakest tidal movements, with a climate as benign as that of the early Middle Ages, is about four centuries ahead. We have therefore begun to move strongly into a period of warmer, milder weather. There will be fluctuations, as earth and sun and moon move through space and the tidal power waxes and wanes. But the long trend is toward a warmer earth; the pendulum is swinging. END

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A KENTILE FLOOR COSTS SO LITTLE

when you install it yourself!..

KENTILE

GUARANTEE

FOR SELF-INSTALLED KENTILE

Kentile, Inc. will provide new tile without charge for any Kentile that wears out... and on which colors wear off... during your own occupancy of your home wherein you have installed Kentile. This guarantee does not apply to damage caused by improper handling, or failure to follow the instructions for installation and maintenance available at your Kentile dealer's.

Why buy floor coverings with just a colored surface that soon wears off? It costs so little more to get wear-resistant KENTILE with colors that go all the way through the tile and backed by this GUARANTEE!

GUARANTEED KENTILE IS SO EASY TO INSTALL

TILE by tile installation is quick, fun. And your Kentile Floor lasts for years... sheds dirt... resists stains and scuffs... sparkles like new with an occasional no-rub waxing.

Only your Kentile Dealer has low-cost, guaranteed Kentile Floors... the Ken-Kit with the tools you need. Get an estimate ... look in your classified phone book under FLOORS... in Canada at T. Eaton Co., Ltd.

FREE BOOKLETS. Send for a copy of the Kentile Self-Installation Folder and the Kentile Color Line. You'll see how easy it is to install your own Kentile Floor in your choice of the 26 modern colors. Kentile Inc., Dept. H-4, 58 2nd Avenue, Brooklyn 15, N. Y.

*Price quoted is for a 9'x11' Kentile Floor installed by you. Price may be lower or slightly higher depending on size of room, colors chosen and freight rates.

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The Asphalt Tile of Enduring Beauty

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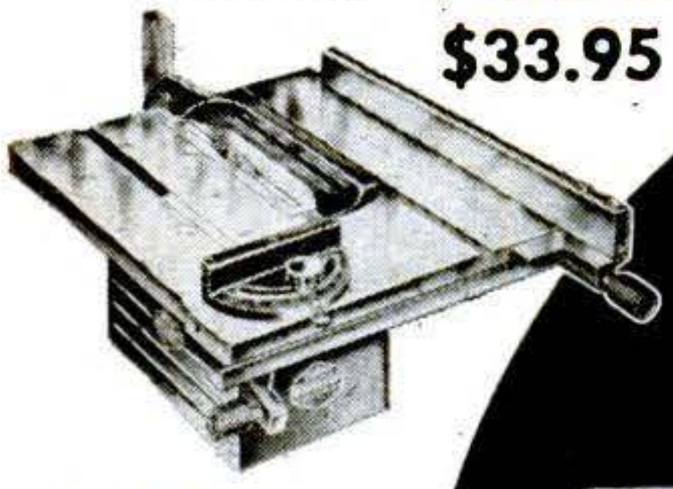
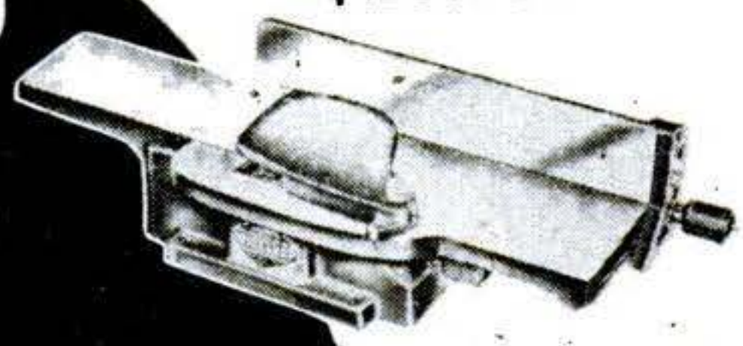
LOOK!

Atlas WORKSHOP TOOLS

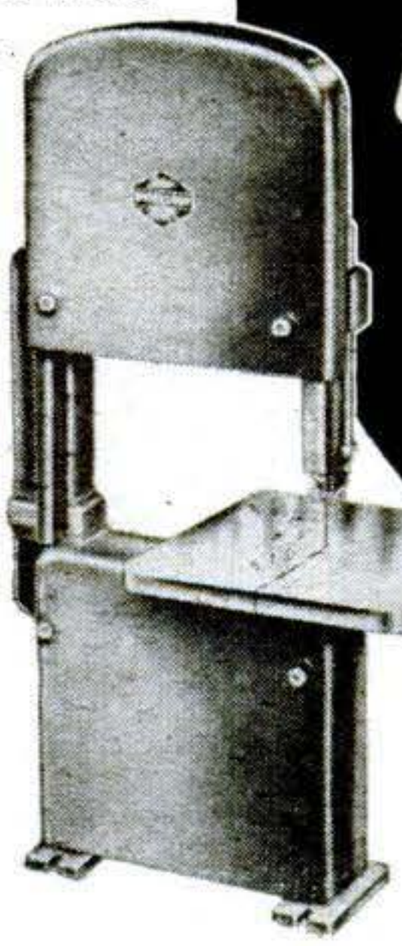
★ NEW 8" BENCH SAW
$33.95



★ NEW 4" JOINTER
$28.75

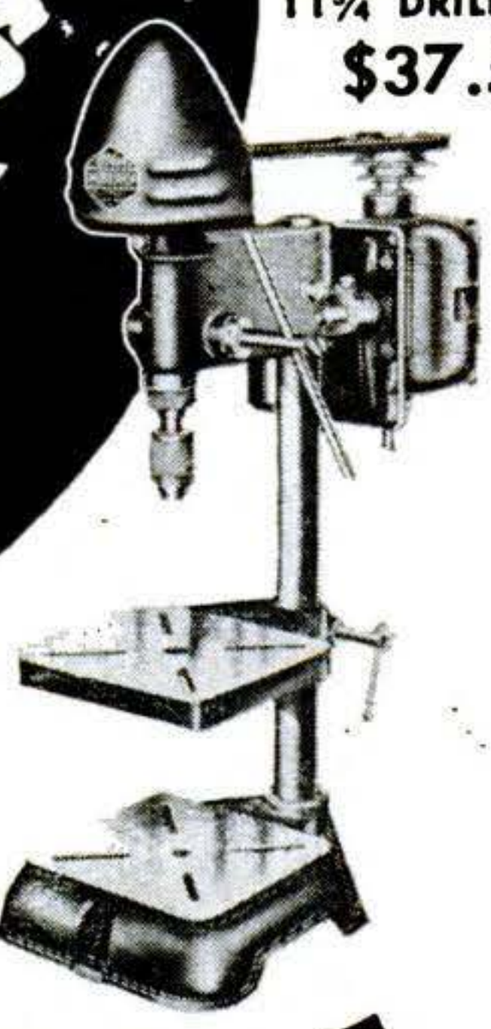


★ NEW 10" BAND SAW
$42.50



These 5 Atlas Workshop Tools FOR ONLY $161.20

★ NEW 11¾" DRILL PRESS
$37.50



★ NEW 13" JIG SAW
$18.50

ALL PRICES LESS MOTOR
F.O.B. KALAMAZOO, MICH.

— AND ALL CAN BE OPERATED FROM 1 MOTOR

★ Look at the tools . . . *look at the prices!* If you're one of those men who have long wanted a home shop equipped with fine precision tools, but haven't wanted to spend the money for large, expensive machines — these Atlas Workshop Tools will suit you to perfection. Each one is backed by 40 years of Atlas precision-engineering. They give your shop *greater* versatility at *less cost* than any tools or combination tool you can buy! — *and all 5 can be powered with 1 motor!* You'll want to see them at your first opportunity. Ask any Atlas or Atlas-Power King dealer for full details. Send the coupon for complete catalog.

SEND FOR FREE CATALOG

ATLAS PRESS CO.
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Please rush your Workshop Tool catalog.

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ATLAS PRESS COMPANY
1055W N. PITCHER ST.
KALAMAZOO, MICH.

DEPENDABLE QUALITY TOOLS

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Engineers Invade Another Wilderness

[*Continued from page 101*]

roads through forests to the site of Canyon Dam on the Nechako. A branch line of the transcontinental railroad that ends at Prince Rupert will be thrust across a wooded pass to Kitimat, and this obscure Indian village of 250 souls will become a city of 50,000.

Some engineers believe the tunnel west of Tahtsa Lake represents one of the two finest hydroelectric power sites left in North America. The other also has its origins in British Columbia. In mechanics, it is the same sort of Rube Goldberg gadget as Kitimat. Several of the lakes at the source of the Yukon River would be turned around to foam 19 miles through gorges and a tunnel to tidal flats along the Pacific Ocean. The Aluminum Company of America has already staked out ground in the vicinity of these flats.

Boom Outdoes Gold Rushes

Hydroelectric power is just one phase in the development of a fabulous frontier that until recently was largely overlooked.

The greatest land, mining and timber boom since the bygone settlement of the Oregon Country is stirring Canada's westernmost province, vast and picturesque British Columbia. It surpasses the Klondike and Nome and Cariboo gold rushes all rolled into one. More newcomers have migrated to British Columbia during the past 10 years than in the entire first century after a daring Argonaut named Alexander Mackenzie demonstrated that the North American continent could be crossed. Since 1940 the population of British Columbia has soared nearly 43 percent. This is triple the rate of growth in the rest of the continent.

Gas Pipe to Parallel Highway

Men with tractors and bulldozers are breaking the sod of remote valleys hemmed in by peaks more than two miles high. The most northerly pulp mills on the continent rear lofty chimneys above spruce and hemlock forests that until recently were threaded only by Indian trails. The biggest lead and zinc smelter on earth now stands along the upper reaches of the Columbia River. Soon Consolidated Mining will be made still bigger by a $65,000,000 expansion.

The section of British Columbia tapped

[*Continued on page 260*]

10 Times Faster than hand sawing

A Professional Carpenter's Saw

6" model cuts 2"—Only $65.
8" model cuts 2⅞" — Only $87

Wait till you guide one of these smooth working Guilds through lumber . . . or plywood, compo-board, even aluminum siding! Then you'll know what *cutting speed* is! . . . and what the powerful Guild motor can do. You'll be amazed how easy it is to rip with one of these saws—how easily you can cross-cut, dado, plough or groove. Guild Saws are light and perfectly balanced—they've full safety protection—and they're extremely accurate. Best of all, they're THE BUYS OF THE YEAR IN POWER SAWS.

No other saw offers all the value-features of Guild: the new built-in tilting adjustment with easy-to-read quadrant giving angle setting up to 45°; new quick depth regulator which allows base to be raised or lowered by a mere twist of the knob; efficient helical gear drive; precision ball bearings; retractable safety guard; polished aluminum frame.

Look over both saws—decide which best suits your purpose—then take advantage of one of the most sensational value offers ever made. MAIL COUPON TODAY.

Please send me full information on the Guild 6" and Guild 8" Saws — also name of my nearest dealer.

Name.....

Address.....

City.....State.....

PORTER-CABLE MACHINE CO.
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be SURE of STARTING in any kind of weather!

BUY THE SENSATIONAL NEW
Redi-Warm
TRADE MARK
AUTOMATIC ENGINE TENDER

Thermo Stop-Start Engine Warmer

A.

MAIN UNIT

At last the luxury of knowing your car will start as easily on a sub-zero morning as it will on a summer day. With a Redi-Warm Automatic Engine Tender in your car, it makes no difference where you park — how long you park. No outside electrical connections necessary — no smudge pots — no spark boosters. Just touch your starter, and you're off in a jiffy.

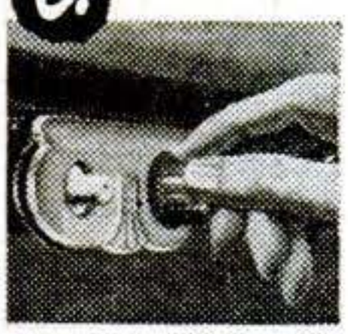
Widely acclaimed by automotive engineers, Redi-Warm is a marvel of simplicity. It consists of only three small units — a thermostatic control which clamps easily to the engine head; a neutral switch which permits Redi-Warm to operate only while the car is in neutral; and a dash switch with which to put Redi-Warm in operation.

B.

NEUTRAL SWITCH

Saves Engine Wear—Saves Gas

It is a well-known fact that the most wear on an engine occurs during the minutes required to start it. Redi-Warm, by keeping the engine at normal temperature — regardless of weather conditions — insures quick, easy starting — preserves the motor, saves on gas. Besides the comfort and convenience it affords, Redi-Warm will more than pay for itself in a few cold weather months.

C.

DASH SWITCH

Why risk loss of time — loss of temper — expensive towing charges? If your local dealer does not have Redi-Warm in stock, send for it direct from the factory. It costs only $24.95 postpaid; comes with complete instructions for the simple wiring. Do it yourself, or ask your neighborhood serviceman. Sold on an absolute guarantee of full satisfaction.

only $24.95 postpaid

- KEEPS ENGINE ALWAYS AT STARTING TEMPERATURE REGARDLESS OF WEATHER.
- CAR CANNOT BE STARTED WHILE REDI-WARM IS SET FOR OPERATION; THIEF-PROOF — FOOL-PROOF. DOUBLE BATTERY LIGHT.
- SAVES WEAR ON ENGINE; SAVES GAS ORDINARILY USED IN CHOKING.
- SAVES TIME — SAVES TEMPER — ELIMINATES COSTLY TOWING CHARGES.
- PAYS FOR ITSELF OVER AND OVER.

Agents Wanted

CRAY-LINCOLN
Eng. & Mfg. Co., Inc.
CRAY OIL BLDG.
North Walpole, N.H., U.S.A.

Engineers Invade Another Wilderness

[Continued from page 259]

by the Alaska Highway contains more than 37,000,000 acres where petroleum is believed to lurk. Already six or eight wells spout natural gas, giving promise to a pipe line along the highway and then southward to Vancouver, now Canada's third city in population.

In the green groves of Vancouver Island is rising the largest newsprint plant under construction anywhere in the world.

Rivers Flow in Three Directions

Few other places in this hemisphere are quite so diversified as British Columbia.

Ocean Falls on the thickly wooded seacoast has the heaviest rainfall of any North American community. Yet sagebrush and tumbleweed worthy of the Mojave Desert glut some of the arid valleys of the interior.

British Columbia is ribbed with swift and mighty rivers that would be a legend elsewhere, but are virtually lost in this wilderness. The Fraser, the Stikine, the Skeena, the Bella Coola—they nourish a salmon industry of more value than that of any state, even of Oregon and Washington combined. Three of the great rivers of the globe have their sources in British Columbia: the Yukon, the Columbia and the Mackenzie. The province tilts in so many directions that its white-spumed rivers flow to the Pacific Ocean, the Bering Sea and the Arctic Ocean.

From fields of cantaloupe and apricot orchards in the south, British Columbia extends almost 200 miles beyond the Alaskan capital of Juneau in the north. It is probably the only domain in the world than can yield both reindeer meat and honey. Along its Stikine River roam almost as many great brown bears as on Kodiak Island in Alaska. Governor Ernest Gruening of Alaska once jested, "British Columbia is like Alaska—only more so."

Roads Open New Territories

The Alaska Highway extends for 618 miles upon the soil of British Columbia, as compared with only 302 miles inside Alaska itself. In fact it may have been the famous thoroughfare hacked through the wilds by American Engineer troops that first attracted the attention of investors and technicians to this 366,255-square-mile treasure trove of natural resources.

[Continued on page 262]

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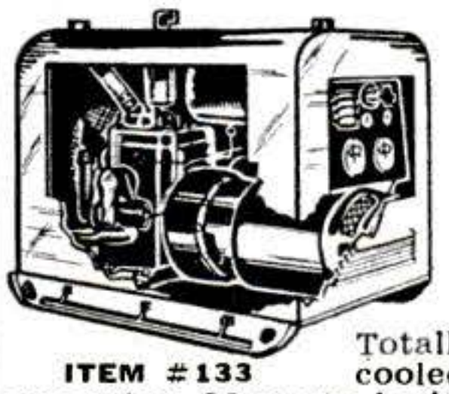
PREPARE NOW FOR POWER FAILURE! IMMEDIATE DELIVERY—LARGE STOCK—MANY SIZES

A. C. GENERATING PLANTS

DESIGNED FOR CONTINUOUS OR INTERMITTENT SERVICE

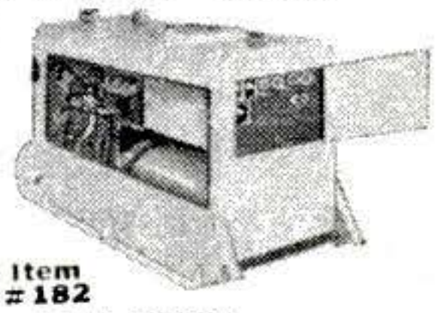


ITEM #133

Item #133—3 KW—120 Volt—60 Cycle A.C. Single Phase HEAVY DUTY PLENTY OF CURRENT TO OPERATE YOUR—• OIL BURNER • REFRIGERATOR • HOME FREEZER • SUMP PUMP • POWER SAW • BROODER • CREAM SEPARATOR • INCUBATOR • VENTILATING FANS • MILKING MACHINES • BLOWERS • YARD LIGHTING • OTHER APPLIANCES

Totally enclosed power unit with 2 cylinder water-cooled Hercules Model BXB engine direct coupled to generator. Magneto ignition, crank start, 4 gallon gas tank, 3 qt. oil capacity. Skid mounted with handrails for carrying. Instrument panel including killer button, oil pressure, water temp. gauges, voltmeter, ammeter. Shipping wt. 560 lbs. F.O.B. Chicago. Item #133 ..... **395.00**

Write for information on other size generating plants ranging from 350 watts to 25 KVA



Item #182

Item #182—Onan Generator—5KW—120/240 volt—60 cycle A.C. single phase, direct coupled to Willy's Jeep 4 cylinder engine. Shpg. Wt. 1200 lbs. F.O.B. Chicago **895.00**

Item #178—350 watt—110 volt—60 cycle A.C., direct coupled to 1 cylinder Midco engine. Shpg. Wt. 116 lbs. F.O.B. Chicago.... **125.00**

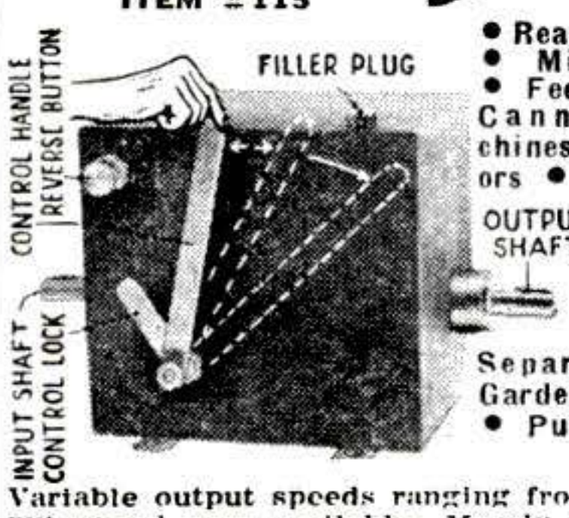
Item #178

GROBAN'S FALL & WINTER War Surplus SPECIALS!

ALL BRAND NEW — FULLY GUARANTEED

HYDRAULIC SPEED REDUCER WITH FINGERTIP CONTROL

ITEM #115

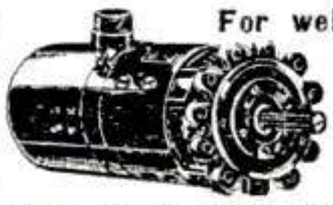


USE FOR: • Reamer Drives • Midget Cars • Feed Mills • Canning Machines • Conveyors • Lathes • Milling Machines • Motor Boats • Cream Separators • Garden Tractors • Pumps

Variable output speeds ranging from 0 to input speed now available. Merely move control handle until desired speed is attained. Then turn locking handle to maintain the setting. Internal relief valves prevent overloading. Use input power of ¼ to 1½ H.P.—

This Westinghouse-Oil Gear Unit converted to commercial use from 40 MM anti-aircraft traversing mechanisms consists of a variable displacement hydraulic pump feeding a fixed displacement hydraulic motor. These components are contained in a crackle-finish steel oil reservoir (capacity 2 qts.). Adjustable relief valves set at factory for 100 inch pounds of torque may be reset up to 180 inch pounds. Independent reverse control allows full output power and speed selection in either direction of rotation. Both input and output shafts measure ⅝" diam., include keyway. Input rotation is counter-clockwise facing shaft. Recommended input speeds not to exceed 750 R.P.M. Over-all dimensions 7½"x7½"x11½". Gov't acquisition cost. $428.00. Shipping weight 31 lbs. Complete with 2 qts. of oil and full instructions. F.O.B. Chicago.... **54.50**

D. C. GENERATORS



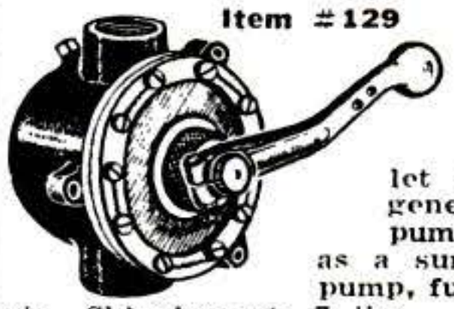
For welders, plating, truck and marine use, D. C. appliances, lights, etc. Aircraft quality—lifetime grease sealed ball bearings. Heavy duty.

Item #90—Type P-1, rated 200 Amps.—28 Volts, 2500 RPM. Mfd. by General Electric, Ford, Delco-Remy and Westinghouse. Gov't. Acq. Cost $300.00. Shpg. wt. 53 lbs. F.O.B. Chicago..... **22.50**

Item #91—Type R-1, rated 300 Amps.—30 Volts. Mfd. by Jack & Heintz. Gov't. Acq. Cost $380.00. Shpg. wt. 59 lbs. F.O.B. Chicago. Each individually packed in wooden box..... **35.00**

HAND FLUID PUMP

Item #129



Type D4—Bronze and aluminum construction. ¾" pipe thread inlet and outlet. Fine general utility hand pump. May be used as a sump pump, barrel pump, fuel transfer pump, etc. Shipping wt. 7 lbs. F.O.B. Chicago **11.95**

HYDRAULIC EQUIPMENT

Large supply of new labor-saving, economical hydraulic equipment in many types and sizes. Use these positive, highly efficient smooth pressure hydraulics on presses, arbors, lifts, loaders, power control, positioning, brakes, plastic dies, auto frame alignment, etc., etc.

ITEM #70—Purolator hydraulic oil filter. Permanent element type. ⅜" female pipe thread ports. Capacity 16 gallons per minute. A $13.00 value. Now **postpaid**..... **4.95**

ITEM #127—Double acting hydraulic cylinder, 1" bore, 1" stroke, ½" diam. shaft, ¼" tubing thread ports. Over-all length closed—6½". Clevis mounting at both ends. Perfect for clamping and feeding. **Postpaid**..... **5.95**

Item #39

ITEM #33C—Double action hydraulic cylinder, 1½" bore, 4½" stroke. Clevis mountings at both ends. Uses ¼" pipe fittings. **Postpaid** **8.95**

ITEM #16C—Double acting hydraulic cylinder, 1½" bore, 26" stroke. Will lift 1760 lbs. with 1000 PSI line pressure. Weight 8 lbs. A $55.00 value. Now Only, **Postpaid**..... **16.95**

Item #126

Item #39—Vickers Hydraulic Pump Piston Type. Ideal for use with hydraulic cylinders and valves described in this page ad. Vickers constant displacement piston type pump delivers .507 cubic inches per revolution. 8 gallons per minute at 3750 RPM. 1000 PSI. Has ½" diam. shaft, ¾"-18 thread inlet and outlet ports. Rotation—clockwise. Ppd. **19.90**

Item #126—Four-way, open center control valve with built-in adjustable relief valve. Factory set at 1000 PSI., spring-loaded neutral position for use with one double-acting cylinder. Fully balanced plunger type, smooth, positive, easy operation, can be used as single unit or mounted in series of any combinations desired. Has ¾" pipe thread inlet and outlet, ½" pipe thread cylinder ports. Newly manufactured to our specifications. Shipping weight 8¼ lbs. An outstanding Buy! F.O.B. Chicago..... **21.50**

ITEM #103—Double acting hydraulic cylinder, 2½" bore, 17" stroke. Clevis mounting. Will lift 4900 lbs. with 1000 PSI line pressure. 1¼" diam. shaft, ⅜" tubing thread ports. Overall length closed 28". Shpg. wt. 11 lbs. F.O.B. Chicago..... **21.50**

Item #42

ITEM #31C—Double action hydraulic cylinder, 3½" bore, 11" stroke. Aluminum alloy cylinder wall and all steel 1⅛" piston rod. Clevis mounting at base and shaft. 19½" overall length closed. Will lift 9625 lbs. using 1000 PSI from Logan Heavy Duty Hydraulic pump. Uses ⅜" tubing fittings. Value $102.00. Shipping wt. 11 lbs. F.O.B. Chicago **22.50**

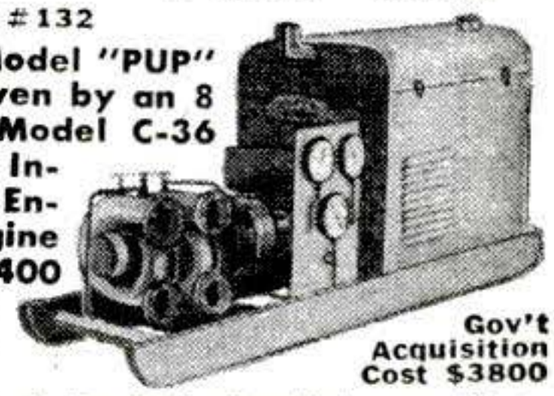
ITEM #6—Double action hydraulic cylinder, 3" bore, 24" stroke, will lift 7070 lbs. with 1000 PSI line pressure. Steel barrel. 1⅛" stainless steel shaft. Gov't. acq. cost $176.90. Shpg. wt. 26 lbs. F.O.B. Chicago **28.00**

ITEM #42—Double action hydraulic cylinder, 4" bore, 18" stroke. Rated lift capacity with 1000 PSI line pressure is 12,500 lbs. Ship. wt. 30 lbs. F.O.B. Chicago. An Excellent Buy for **32.50**

Byron-Jackson "PUP"

CENTRIFUGAL PUMP UNIT

Item #132



2 Stage Model "PUP" Pump driven by an 8 Cylinder Model C-36 Chrysler Industrial Engine. Engine speed 2400 R P M — 100 H.P.

Gov't Acquisition Cost $3800

600 GPM at 175 PSI—Parallel connection
300 GPM at 375 PSI—Series connection

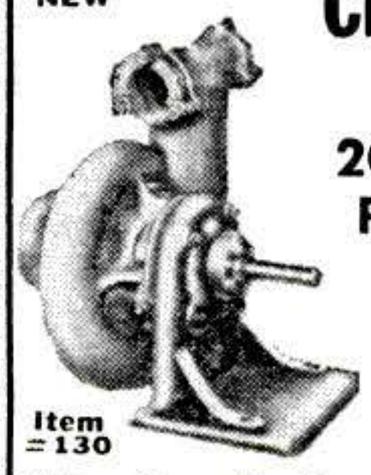
Ideal For • PIPE LINE SERVICE • IRRIGATION • PICK-UP • SALT WATER DISPOSAL • GATHERING • FIRE FIGHTING • DEWATERING • SPRINKLERS • CONSTRUCTION

These skid-mounted Pumping Units are standard production models with parts and service readily available. Designed for a wide range of operating conditions particularly where wide variation in head and capacity are required. Twin suction and discharge ports are cast on the same side and so arranged that external piping is interchangeable for either parallel or series pumping applications. Overall dimensions, 114" L x 29" W x 62" H. Weight 2480 lbs. Now, complete with operating instructions, performance data. F.O.B. Chicago **1495.00**

GENERAL MOTORS—ALLISON

CENTRIFUGAL PUMP

BRAND NEW



Item #130

200 GALLONS PER MINUTE

• For Draining Basements • Fire-Fighting • Irrigation • Fuel Transfer • Swimming Pools • Home Water Systems • Dewatering

This General Motors-Allison Centrifugal Pump—designed for use on U. S. Air Force Mustang fighters, now converted for commercial, home, and industrial high volume pumping applications. Inlet, 2½" standard pipe thread, twin outlets with 1¼" pipe thread, ball bearing supported ¾" shaft. Easy, fast simple priming. Rotation, counter-clockwise facing shaft. Shipping wt. 35 lbs. Gov't acq. cost $145.00. F.O.B. Chicago Now Only..... **39.50**

Suction Lift	Head Pressure	Gal. Per Min.	H.P.	R.P.M.
10'	75'	260	6.0	3500
10'	65'	200	5.2	3500
10'	80'	40	1.5	2500
10'	50'	140	5.0	3500
10'	30'	100	3.0	2500

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Order NOW and SAVE!

Only $19.95

$27.95 VALUE!

Here's YOUR chance to let power—Cummins Power—do the work! Does hundreds of jobs faster, better AND SO ECONOMICALLY! This offer is good for a limited time only, SO ACT TODAY!

MAKES A PERFECT CHRISTMAS GIFT

JUST LOOK AT WHAT YOU GET!

Complete kit for all-around sawing and drilling — You'll use it on 90% of *ALL the jobs around the house and in the shop!* Cool running, perfectly balanced, 115 volt motor—2-1 planetary reduction gear for surging power—die-cast aluminum body—ball bearings for long life—¼" chuck for drilling—4 inch saw blade—base adjusts for maximum depth of cut of 1 5/16"—Can be used as a portable saw, right on the job, or can be mounted in the sturdy, steel, horizontal base as a bench saw!

BUILT TO LAST AND BUILT TO WORK!

SEND ONLY $1.00!

And pay the postman the balance, plus postage and small C.O.D. charge—or send $19.95 and WE pay the charges.

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☐ I enclose $1.00. Send me the Big Combination offer. I will pay the postman balance, plus postage and C.O.D. charges.

☐ I enclose $19.95. Send me the big Combination offer postpaid.

Name_____

Address_____

City_____ State_____

Engineers Invade Another Wilderness

[Continued from page 260]

From the raw and booming lumber city of Prince George, its population up a prodigious 210 percent since 1940, the Provincial Department of Public Works is slashing a costly road through the muskeg to connect with the Alaska Highway. This road will be ready early in 1953.

Railroads Shrink Wilderness

By that time Prince George will be a bustling rail citadel in the backwoods, with the echo of locomotive whistles caroming off the crags. Track crews are extending the scenic Pacific Great Eastern Railway into Prince George. There it will link up with the northern transcontinental branch of the Canadian National, which has its terminus at Prince Rupert on the seacoast. This was once the old Grand Trunk Pacific, constructed 40 years ago by a bearded American named Charles Melville Hays, who saw it as the shortest avenue to the lush trade coming from the Orient.

During World War II it was a railroad of destiny. The U. S. Army ballasted the main line and lengthened spurs. Over these wilderness rails traveled the soldiers and equipment headed for the defense of Alaska. The timbered hills near Prince Rupert were honeycombed with ammunition dumps. Fearful of another Halifax or Black Tom disaster, the Joint Chiefs of Staff ordered blockbusters hauled to the Pacific over this lonely route bisecting three mountain ranges, rather than through the congested harbors of Seattle, Portland and San Diego.

Loggers Find Paradise

The concrete docks where bombs were loaded for Okinawa and Guadalcanal now are heaped with logs. The powder dumps have given way to the chemical baths where high-acetate wood pulp is dissolved. At this farthest north of all railroads on the Pacific seaboard, the Celanese Corporation of America has just constructed a mill that will produce the raw material for 200,000,000 pounds of yarn and fiber annually.

At the ends of fiords as deep and majestic as the Yosemite Valley, logging crews are toppling spruce and hemlock sentinels that were growing in 1792 when Captain George Vancouver sailed along this coastline in H.M.S. *Discovery*. Some of the loggers live

[Continued on page 264]

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Look at these features:

- *Will not warp, chip or craze*
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Please send me without cost or obligation, a full-color, descriptive brochure and sample of Vikon Tile.

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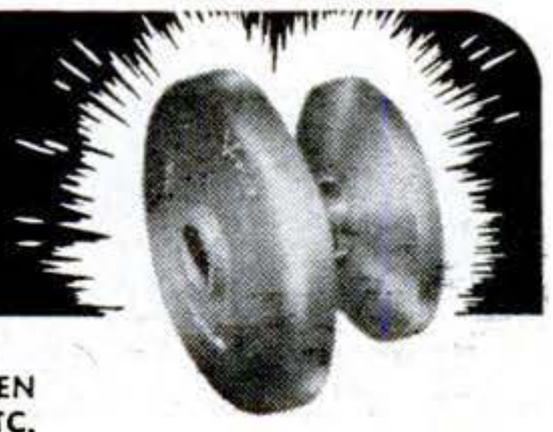

for . . . POWER LAWNMOWERS, MOTOR SCOOTERS, GARDEN TRACTORS, MOTORBIKES, ETC.

The Way to transmit Power Smoothly

WRITE FOR FREE FOLDER

V-PLEX CLUTCHES automatically tighten drive belt as throttle is opened, eliminate belt slippage, cut wear, permit idling engine. Easily installed on any gas engine; practically indestructible. Fit ½, ⅝, ¾" drive shafts. See dealer or write.

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LIGHT INSPECTION CAR WORKS — HAGERSTOWN, INDIANA

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Red Devil putty knives and wall scrapers

THE CRAFTSMAN'S WELL-TEMPERED FRIEND

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RED DEVIL TOOLS, IRVINGTON 11, N. J., U. S. A.

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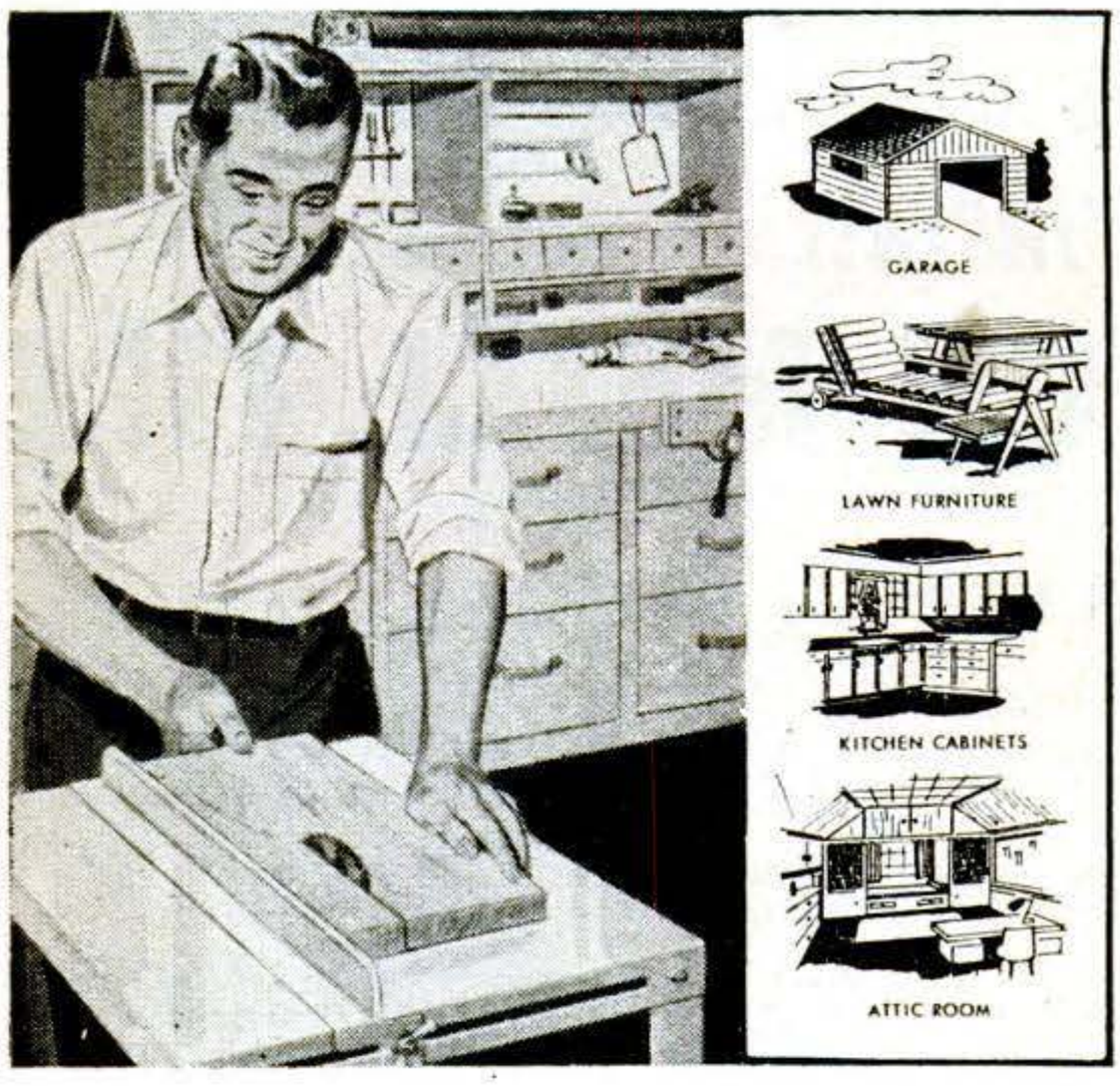
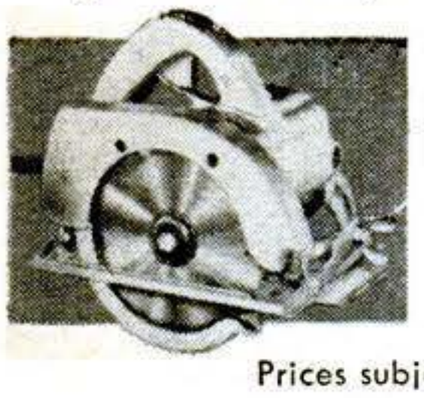
You give him SKIL tools ...we'll give him the plans!



. . . and your gift will pay for itself many times over

You **give him SKIL Home Shop Tools for Christmas and** ***we'll*** **give him six SKIL-Charts, detailed plans for home projects he can build by himself in his spare time! Send in the coupon below.** ***Thousands*** **have found a world of enjoyment in this money-saving hobby!**

SKIL Home Shop Tools are sturdy and dependable. And there's one for every home shop need. Whether he builds furniture or a garage, these money-saving tools will speed work and give him many hours of pleasure all year long!



SKIL Home Shop Saw—Model 520: 5⅞" diameter blade. Weight: 10½ pounds. Depth adjustment from ¾" to 1⅞". Quickly adjusts for bevel cutting any angle up to 45°. With suitable blades you can cut wood, metal and plastics. $59.50.

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FREE! Set of 6 SKIL-Charts show how to buy materials and build wonderful home projects like those above. Just mail the coupon today!

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Engineers Invade Another Wilderness

[Continued from page 262]

in barracks where only the tepees of Indians or the lean-to's of patrolling Mounties have stood before. Others bivouac in wanigans, those cabins on barges that can be pulled by tugs from inlet to inlet.

Much of British Columbia's timber cloaks mountains that dip into the sea. Logs are floated to Prince Rupert in cigar-shaped rafts. Under a special license from the provincial government, the Celanese Corporation can level only as much timber as comes to maturity each year.

Mantling an area considerably more than twice the size of New York State, the forests of British Columbia do more than produce lumber and pulp. Their roots hold rain and snowfall in the ground and thus provide great rivers with a steady flow.

Pioneers in Play Clothes

Each year Americans spend $35,000,000 looking over this land of contrasting luxury resorts and primitive camps—a frontier province where Royal Mounties with traditional Stetson hats and white lanyards maintain law and order. Visitors may bask in tile swimming pools, or try to climb a granite spire as precipitous as the Empire State Building. By paying a $60 trophy fee, a hunter can take out a moose head with huge palm antlers. Many an American stays on to try his luck at accumulating a bonanza as well as catching the 30-inch Kamloops trout.

One recent example symbolizes the whole new order of things. A mackinaw-clad visitor, an advance agent of the construction outfit pioneering the Kitimat power project, got off train No. 195 at the resort town of Burns Lake. He rang the bell at the desk of the local hotel where fishermen and moose hunters spend their first night.

People Come to Stay

"I want to reserve a dozen rooms," he said.

"For how long?" asked the clerk.

"Four years," replied the stranger.

When other hinterlands were opened up, it was in the age of the ox team and the single-bladed plow. Now we see a rich frontier of unlimited possibilities being developed in the era of the giant power plant, the streamlined locomotive and nuclear fission. At one stride, British Columbia is going from wilderness to industrial greatness. END

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SURPLUS MACHINE SHOP TOOLS AT PRICES YOU CAN AFFORD

HIGH SPEED DRILLS

¼" to ½" with ¼" Shanks
½" to 1" with ½" Shanks

For the first time at these low prices! HIGH SPEED DRILL BITS UP TO ½" FOR YOUR ¼" DRILL AND HIGH SPEED DRILL BITS UP TO 1-3/16" FOR YOUR ½" DRILL. The Tungsten steel content of these drills means they will outlast carbon and regular steel drills many, many times!

DRILLS UP TO ½" FOR YOUR ¼" DRILLS!
Will Fit Any Size Chuck ¼" and Larger

SIZE	PRICE EA.	SIZE	PRICE EA.
¼-	$.30	25/64	$.60
17/64	.45	13/32	.60
9/32	.45	27/64	.65
19/64	.48	7/16	.65
5/16	.48	29/64	.73
21/64	.50	15/32	.73
11/32	.50	31/64	.75
23/64	.55	½	.80
⅜	.55	33/64	.90
		17/32	.90

DRILLS UP TO 1 3/16" FOR YOUR ½" DRILLS!
Will Fit Any Size Chuck ½" and Larger.

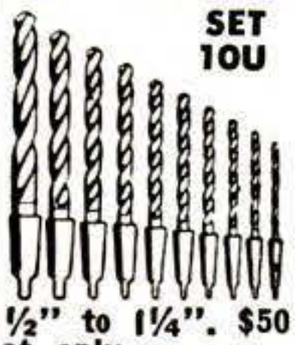
SIZE	PRICE EA.	SIZE	PRICE EA.
33/64	$.91	25/32	$1.86
17/32	.91	51/64	2.05
35/64	1.14	13/16	2.05
9/16	1.14	53/64	2.15
37/64	1.24	55/64	2.25
19/32	1.24	⅞	2.25
39/64	1.30	15/16	2.43
41/64	1.43	31/32	2.50
21/32	1.43	1-1/32	2.80
43/64	1.55	1-1/16	3.05
47/64	1.80	1-5/64	3.56
¾	1.80	1-5/32	3.98
		1-3/16	4.10

HIGH SPEED HAND TAPS

Slightly Used. Excellent Condition

SIZE	PRICE EA.	SIZE	PRICE EA.
8-36 (new)	$.35	½-NC or NF	$.47
¼-NC or NF	.26	9/16-NC or NF	.60
5/16-NC or NF	.29	⅝-NF	.66
⅜-NC or NF	.33	¾-NF	.80
7/16-NC or NF	.39	1-NF	1.25

HIGH SPEED MORSE TAPER SHANK DRILLS



SET 10U 20 Different Size High Speed Morse Taper Shank Drills from ¼" to 1". $70 Value. Priced at only **$12.95**

SET 15U 10 Different Size High Speed Morse Taper Shank Drills from ½" to 1¼". $50 Value. Priced at only **$9.95**

SET 37U 8 Different Size High Speed Morse Taper Shank Drills from 1" to 2" with No. 3, 4, and 5 tapers. $125 Value. Priced only **$29.95**

HIGH SPEED TAPER SHANK CHUCKING REAMERS

SET 25U 15 Different Size High Speed Morse Taper Shank Chucking Reamers up to ½" with No. 1 and 2 tapers. Priced at only **$6.95**

SET 13U 8 Different Size High Speed Morse Taper Shank Chucking Reamers from ¼" to 1". Priced at only..... **$4.95**

SET 12U 10 Different Size High Speed Morse Taper Shank Chucking Reamers from ½" to 1⅛". $65.00 value. Priced at only **$9.95**

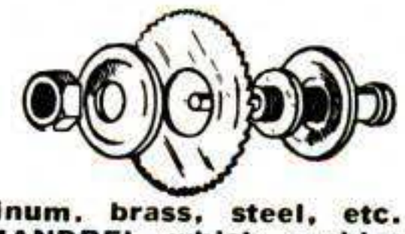
HIGH SPEED STRAIGHT SHANK CHUCKING REAMERS

SET 16U 20 Different Size High Speed Straight Shank Chucking Reamers up to ½". Priced at only ... **$7.95**

SET 17U 10 Different Size High Speed Straight Shank Chucking Reamers ½" to 1⅛". Priced at only... **$9.95**

SET 18U 15 Different Size High Speed Straight Shank Chucking Reamers from ¼" to 1". Priced at only..... **$6.95**

6 Slitting Saws with Mandrel



SET 34U 6 Different Size High Speed Slitting Saws, 2¾" dia. x 1" arbor. Thickness from .040 to .071. Cuts wood, aluminum, brass, steel, etc. PLUS SPECIAL MANDREL which enables use of saws in ¼" or ½" elec. drill. $25 Value. Only..... **$4.95**

NEW HIGH SPEED COMBINATION DRILL AND COUNTERSINKS

SET 2U 8 selected sizes from C2 to F2 (1/16 drill x 13/64 body to 3/16 drill x 7/16 body) 60 degree angle of countersink. New cost on these countersinks 75c to $2.50 when available. Your price for set of 8, only **$4.95**

High Speed Woodruff Key Seat Cutter

SET 4U 5 Different Size Cutters. Can be used as mounted milling cutter or circuar saw. All with ½" shanks, widths up to ¼", diameters up to 1½". Priced at only **$3.95**

BRAND NEW ROTARY FILES

SET 5U 7 Different pcs. High Speed ¼" Shanks. (Complete Set for Less Than Cost of 1 Rotary File) ... **$4.49**

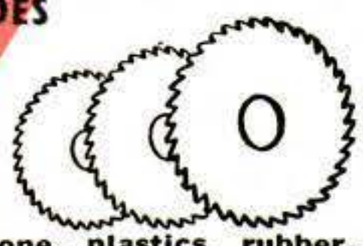
SET 22U 14 Different pcs. as above..... **$8.79**

NEW HIGH SPEED REX CUT-OFF BLADES

⅛	x	¾	x 6	$1.24	ea.
⅛	x	⅞	x 8	1.24	ea.
3/16	x	1⅜	x 6½	1.34	ea.
3/16	x	1	x 8	1.34	ea.
3/16	x	1⅛	x 8	1.34	ea.
¼	x	1¼	x 7	1.34	ea.
¼	x	1½	x 10	1.50	ea.

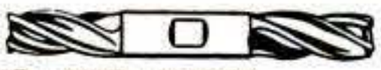
Discounts on Quantities

LARGE SAW BLADES



These large semi-high speed steel, flat ground, circular blades are in excellent, usable condition. Excellent for cutting brass, copper, aluminum and other soft metals, bone, plastics, rubber, paper, etc. 8 x 1/16 x ⅝ arbor $2.75 ea.
10 x 3/32 x 1 arbor.....$3.00 ea.;
12 x 3/32 x 1 arbor.....$4.00 ea.;
14 x 3/32 x 1 arbor.....$4.49 ea.

HIGH SPEED STRAIGHT SHANK DOUBLE END END MILLS

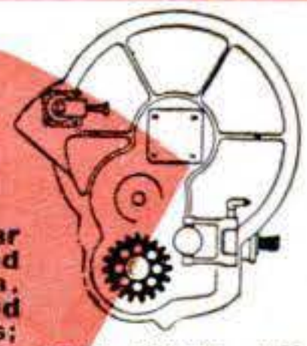


SET 29U 4 Right hand twist 7/16 shank end mills, size 5/16 to 7/16. Used surplus only..... **$3.95**

NEW CARBIDE TIP MASONRY DRILL

Carbide tip goes through any masonry. Set of 5 bits containing one 7/32"; three ¼" and one 5/16", all five, $10 Value, only **$2.49**

THREE-SPEED TRANSMISSION



Contains 7 assorted spur and beveled gears. Has auxiliary power take-off driven from main drive. Three separate gear ratios are 16:1, 12:1 and ¾:1. Contains 10½" dia. ring gear, 5", 2½" and 1½" dia. beveled gears; 3¼", 4" and 2¼" dia. spur gears. All mounted on precision ball-bearings. Main drive has throw-in hand clutch. Auxiliary drive can be engaged or disengaged. Excellent for transmission, winch and many other uses. Wt. 30 lbs. F.O.B. TULSA **$9.98**

10 TO 1 GEAR BOX: throw-out type clutch, ball-bearing throughout. ½" drive spline, 3¼" output gear, rated up to 6 H.P. **$6.49**

90° HEAVY DUTY GEAR BOX: Ball-bearing throughout with ½" drive spline. 1:1 gear ratio which can be changed by different size pulleys or gears. Wt. 5½ lbs. Length 11". beveled gears. Excellent for hot rods, power mowers, etc. Only.. **$5.95**

VEEDER ROOT COUNTERS

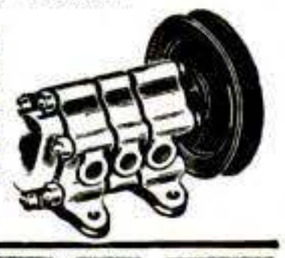
3 Digit clockwise rotation type (New)... **$1.49**
4 Digit clockwise rotation type (New)... **$1.89**
5 Digit clockwise rotation type (Reconditioned) **$2.89**
5 Digit ratchet type (Reconditioned) **$2.49**
5 Digit clockwise rotation type with key reset, complete with key, counts in fives. (Reconditioned)..... **$2.75**
5 Digit ratchet type, with key reset complete with key, counts in singles. New cost about $17.00 when available. (Reconditioned) Only..... **$3.49**
All counters guaranteed against mechanical defects

NEW VICKERS MF9 HYDRAULIC PUMP OR MOTOR

$120 New Cost

Unit is compact, powerful. Rated at 1,000 P.S.I., .600 cu. in. Per Rev. 8 gals. per min. at 3,750 R.P.M. Change rotation by reversing flow. Delivers up to 6 H.P. Requires ⅓ to 6 H.P. to drive directly or by pulley. Only 135 available. Price at only fraction of new cost.... **$16.95**
NOTE: These Vickers Pumps or Motors will fit directly to drive spline of the three gear boxes listed above.

MULTI-PURPOSE PUMP



Three independent pump sections running off of one shaft for single or multiple pumping. Use one as a vacuum pump capable of drawing 25 inches of mercury. The other one or two pumps can be used as a power for sprayers, basement drain, stock watering, etc. Each section rated at 10 GPM at 40 PSI. Comes complete with mounting base and 4" drive gear. Only... **$8.95**

NEW MOUNTED STONES

SET 27U Mixture of 12 Mounted Stones with ¼" shanks. **$1.98**

SET 39U 24 of above **$3.95**

GOOD USABLE HIGH SPEED MILLING CUTTERS

SIDE MILLING CUTTERS

Dia.	Width	Arbor Hole	Price Each
4"	¼"	1"	$3.49
4"	3/16"	1¼"	3.25
4"	⅛"	1"	3.10
3"	5/16"	1¼"	1.95
2¾"	5/16"	1¼"	1.95
2½"	⅜"	¾"	1.79
2"	¼"	⅞"	1.49

STAGGER TOOTH CUTTERS

Dia.	Width	Arbor Hole	Price Each
4"	5/16"	1¼"	$3.49

PLAIN SLITTING SAWS

5"	1/16"	1¼"	$2.49
4"	3/16"	1¼"	2.49

60° double angle 1¼" arbor 2¼" dia.....$2.95
30° single angle 1" arbor 2⅞" dia.....$2.95
3/32" convex cutter ⅝" arbor 1¼" dia.....$1.29

PLAIN MILLING CUTTERS

Dia.	Width	Arbor Hole	Price Each
2"	¼"	1"	$1.79
2"	⅜"	⅞"	1.79
2½"	2"	1"	3.00
3"	⅜"	1¼"	1.97
4"	3"	1¼"	9.95
4"	4"	1¼"	9.95

Discounts on Quantities

Money-Back Guarantee—All Mdse. Mixture of New and Reconditioned Tools Unless Specified Brand New—All Orders (Except Those Specified F.O.B. Tulsa) Are Shipped Post Paid, saving you up to 25% on total delivered cost.

Write for Free Catalog Describing Thousands of Bargain Cutting Tools.

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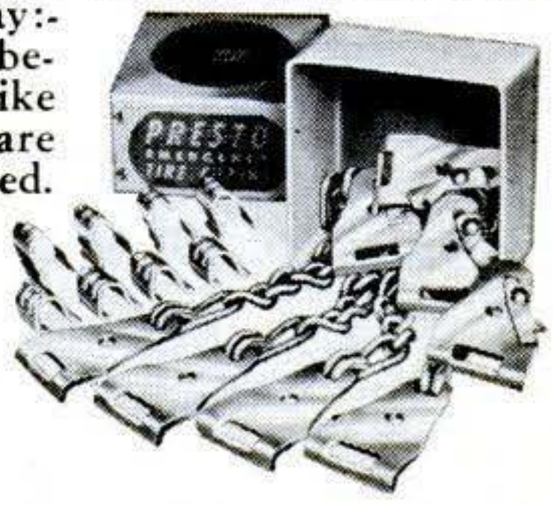
Get Out of Trouble After Your Car is Stuck

On Ice, In Snow, Mud or Sand

An amazing new invention . . . PRESTO Emergency Tire Chains are snapped on to wheels instantly after your car is stuck . . . not before. This assures a saving in fuel, tire wear and time . . . you drive smoothly along with complete confidence of having efficient traction to get out of trouble from wheels spinning next to the curb, in ruts, on ice at intersections, getting up that sloping driveway, off wet and muddy highway shoulders, in mud or snow. Chains are used only when needed and therefore give years of service. There are no straps to tighten . . . no jacking up the car . . . no loss of time, fuel and tires because you can get your car out of trouble instantly, this easy PRESTO way:- Magic clips are inserted between the tire and rim (like wheel balancers) and chains are attached instantly when needed. Wheels stay in balance and the clips are unoticed. One box of four Chains (enough for one car) assures trouble-free driving. Order direct for two weeks trial on our money-back guarantee of your entire satisfaction. Postage prepaid if payment in full is sent with order, or write for free circular.



NO. 1 SIZE (for one car) fit 5.25 to 7.20 tires, $5.95. NO. 2 SIZE (for one car) fit 7.60 to 8.20 tires, $6.45.

Dealers, Agents Wanted.

PRESTO CHAIN CO. 215 W. 7th St. Des Moines 2, Ia.

500-Lb. Car for $500

[*Continued from page 109*]

the car themselves. For others there's the corner garage or motorcycle repair shop.

Lubrication is so simple you don't need a service-station grease job: Engine oil is added or changed as necessary. The front shocks are filled with oil. Wheel bearings need packing twice a year as on big cars. That leaves only the steering and reverse-gear cases, jackshaft bearings, rear-wheel mounts, and chain to lubricate.

Drive after dark, too. The battery-less version of the King Midget can be ordered with lights and a 35-watt, compensated-output AC generator. You have to reach back over the deck to a lever that moves the generator against the engine flywheel (what do you want, dash control?). The automatic compensation gives you good lights even at low speed. The dimmer switch is on the dash.

Where state laws require parking lights independent of the engine, a dry-cell standby battery can be installed.

Any color, as long as it's cream. As part of the price struggle, the makers of the King Midget have standardized everything —even the overspray in the paint booth. It has to help finish the next car, for they spray a cream finish on six cars at once. If you want some other color, it will cost you ten bucks extra.

Buy it knocked down. If you buy a King Midget fully assembled, it will come in its own crate, which you have only to open at one end to roll the car out, ready to run. The crate is returnable.

You can save a few bucks by ordering it in separate units—chassis, engine and drive, fenders, body and so forth. All parts are prefabricated and can be assembled with just a few tools. A booklet giving assembly instructions is provided. If you buy it unassembled, you have to paint it yourself. END

Screw-Nails Stop Floor Squeaks

SQUEAKY flooring may be prevented by applying the planks with helical-threaded nails, Virginia Polytechnic Institute's Wood Laboratory reports. Driven with a hammer but holding like screws, the nails show far greater and more lasting holding power than cut flooring nails or plain-shank flooring brads of equal size. Earlier Institute tests (PS, Sept. '50, p. 126) have demonstrated the usefulness of the helical-threaded nails called Screw-tite nails, in other applications.

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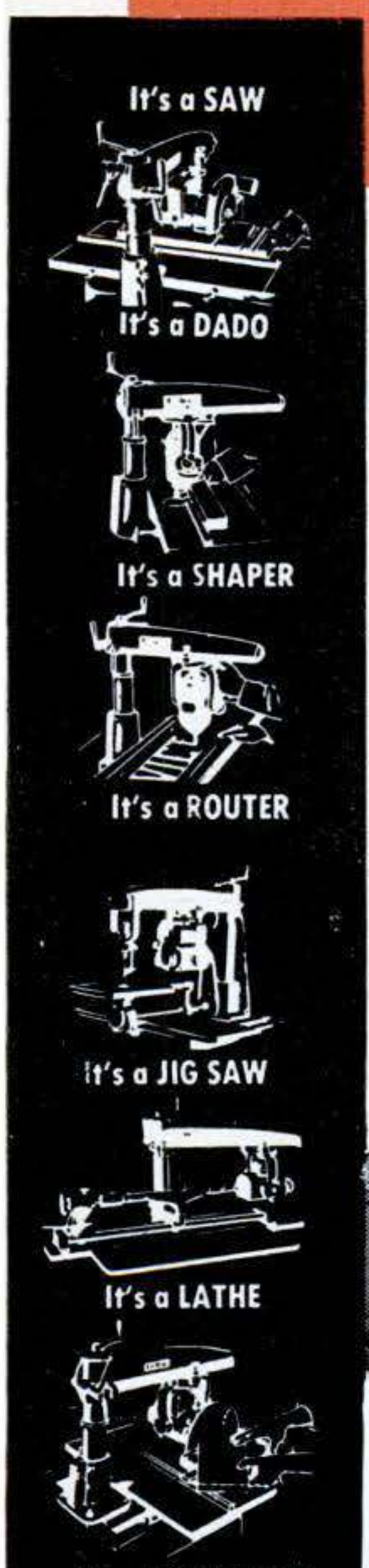
IT'S SUPER FAST! IT'S SUPER SAFE!

It's the ideal machine for home workshops

This versatile, all-purpose, low-cost

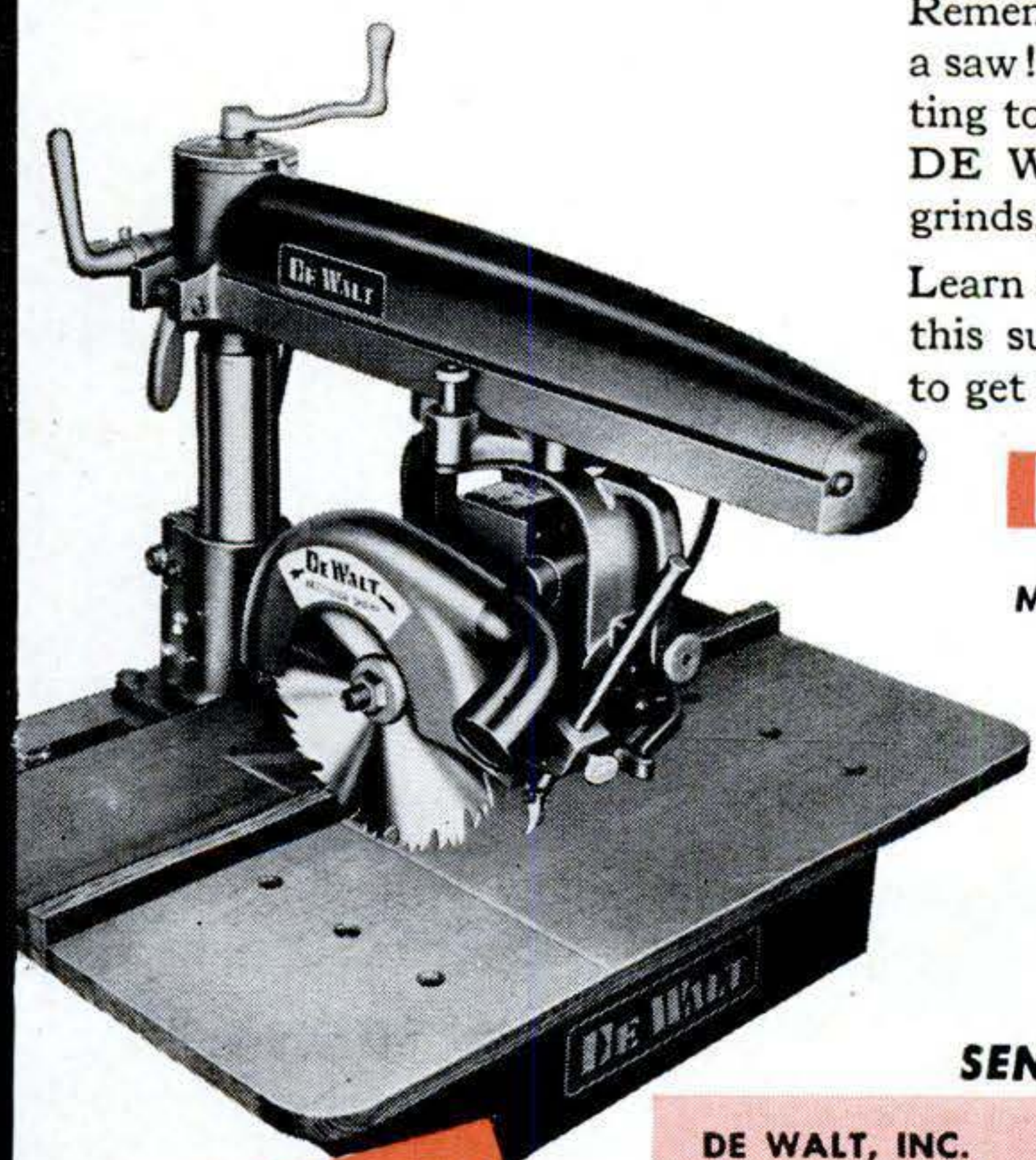
DE WALT "power shop"

does everything in woodworking!



Many times you've probably wanted a machine like this for your home workshop!

It's the world-famous DE WALT radial power saw. It's fast . . . accurate!



It's safe . . . and takes up so little space! You'll find a thousand and one uses for DE WALT . . . as you make furniture, cabinets, shelves, build your own garage or house.

Remember . . . DE WALT is *more* than a saw! Every time you change the cutting tool, you have *another* machine. DE WALT dadoes, routs, shapes, grinds, tenons, drills, etc.

Learn all about DE WALT now. Own this superb power shop! Use coupon to get descriptive literature.

DE WALT INC.

A Subsidiary of American Machine and Foundry Company

SEND FOR THIS FOLDER!

SELLS FOR $229
motor included

DE WALT, INC.
PS-11 Fountain Ave., Lancaster, Penna.

Please send me descriptive literature on the DeWalt Power Shop.

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NEW DRILL INVENTION SAVES TIME! MAKES SCREW-JOINTS STRONGER!

Each Screw-Mate drill corresponds to the exact contour of a screw. That means you can countersink, drill shank clearance and *tapered* pilot hole — all at the same time! No longer must you perform 3 drilling operations, or attach special countersinks and counterbores to drills.

The *tapered* hole made by a Screw-Mate drill enables every thread on the screw to hold tightly — right down to the tip. (Ordinary drill makes straight pilot hole — allows only part of threads to come in contact with wood. Strength is sacrificed.) Screw-Mates are slightly smaller than corresponding screw diameter to provide a good snug fit. This increased holding power allows use of smaller screws. Drill shoulder stops drill at exactly right depth and size.

Screw-Mates are available in a wide variety of sizes for use with most screw sizes on wood, plastics, slates, synthetics, etc. Made of tough high-tungsten steel, they outlive ordinary drills. Screw-Mates fit any drill gun, drill press, or hand drill.

Buy Screw-Mates at your local hardware store today! If local dealer cannot supply you, order by mail, using coupon below. Include cash or money order. No C.O.D.'s. (Dealer inquiries invited)

MAIL COUPON TODAY!

(Circle all the drill sizes you desire)

SCREW-MATE SIZES NOW AVAILABLE!

$.75 each
#5 x 1/2"
#6 x 3/4"
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#8 x 1"
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#12 x 1 1/4"
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$1.00 each
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(Diameter of drill shank is 1/4".)

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5 commonly used sizes packed in handy drill-holder-box.

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$3.75— set of 5 drills

☐ Please rush me postpaid the Screw-Mate drills circled above. Enclosed is $.....in full payment.
☐ Send me FREE information on Screw-Mate drills.

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104-N HOSPITAL ST., PROVIDENCE, R. I.
Distributing Office for the Mfgr.

Shaw Drives the Minx

[Continued from page 126]

for the road across a hood that stretches into the next county . . .

The suspension was so interesting that I took the car over the Speedway's rough infield to see how it felt.

You don't need a big car to get a soft ride . . . With this short wheelbase, you'd expect a lot of pitch on rough ground . . . and you don't get it . . . The front end is just slightly soft . . . she dives a little on a hard bump.

"I like that hood," I remarked to J. Godolphin, the Rootes midwestern service manager who had brought the sedan and a Minx convertible down from Chicago. He was very British.

"The bonnet?" he corrected me with a grin. "The hood is a convertible's top."

High Speed for Low Power

The convertible was the snappier of the two cars, but I stuck to the hard-top for my evaluation. A British motor magazine had clocked a 1950 Minx sedan at 40.2 seconds from a standing start to an indicated 60 miles an hour. The 1951 Minx has a slightly larger engine. I took off for the backstretch.

You have to know how to drive these low-horsepower engines . . . or they lug in high gear at low speed . . . and that's not good for any engine . . . We'll run through three gears to 60 . . . Fifteen seconds, 20 . . . 28, with the wind.

I turned and took it against the wind.

. . . Twenty-five . . . 27 . . . 30 to an indicated 60.

Then I tried going through four gears, both directions, to get the advantage of quick initial acceleration. It was better. I averaged out to 26.3 seconds. The speedometer later calibrated by stopwatch to a measured quarter-mile at 57 miles an hour when indicating 60. That, for my money, was tops on 42 horsepower.

The British Are Honest

It took three-quarters of a mile, however, to make the Minx touch 74 miles an hour indicated, its top speed. That left something to be desired. The British are rigorously honest, by the way. The speedometer-dial readings on the Minx go to 75 and stop, period.

"Quite a sedan," I remarked to Mr. Godolphin as I returned to the pits.

"You mean a saloon," he said.

"Well," I laughed, "that word means something else over here." END

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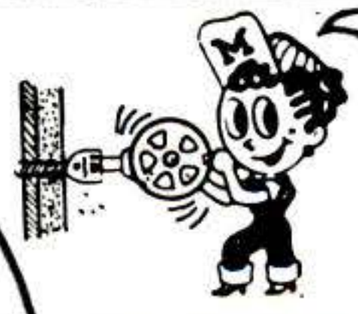

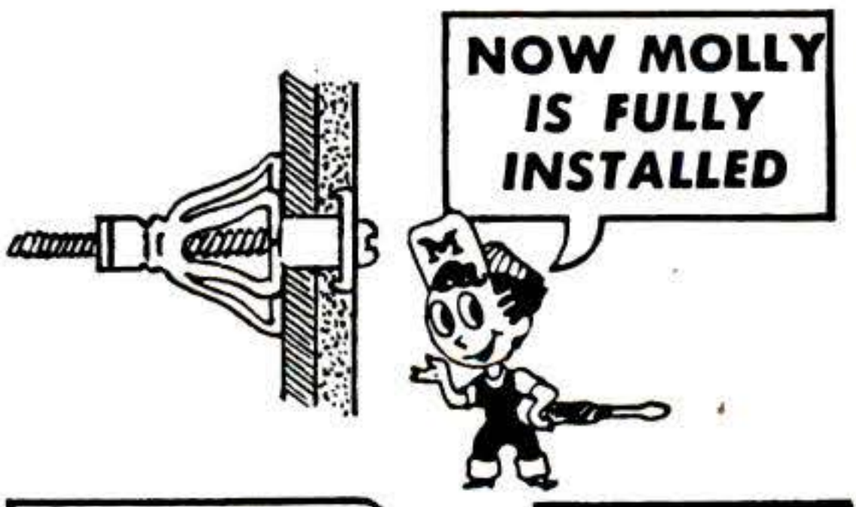

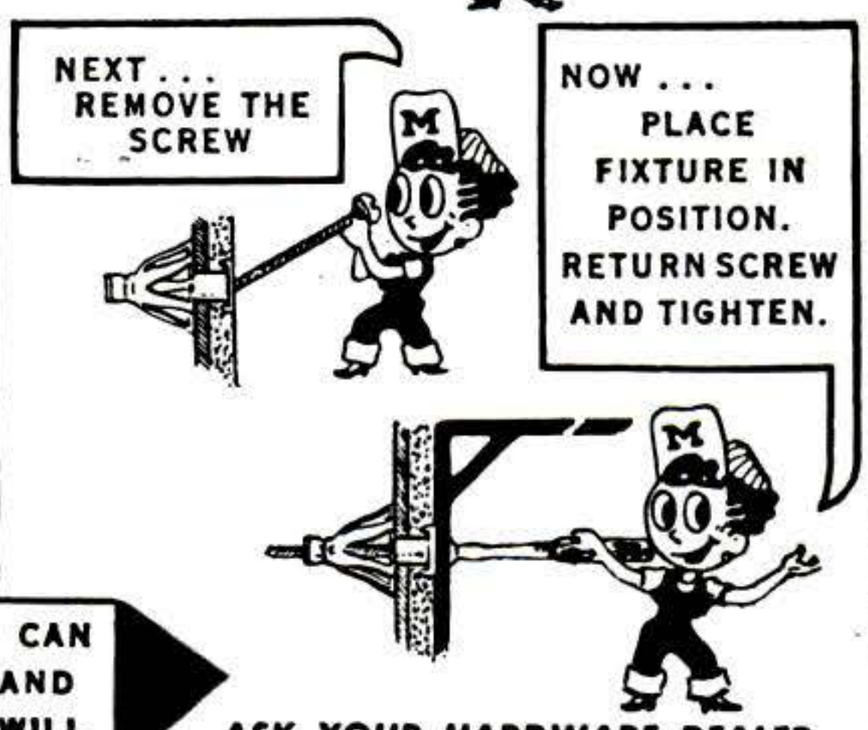

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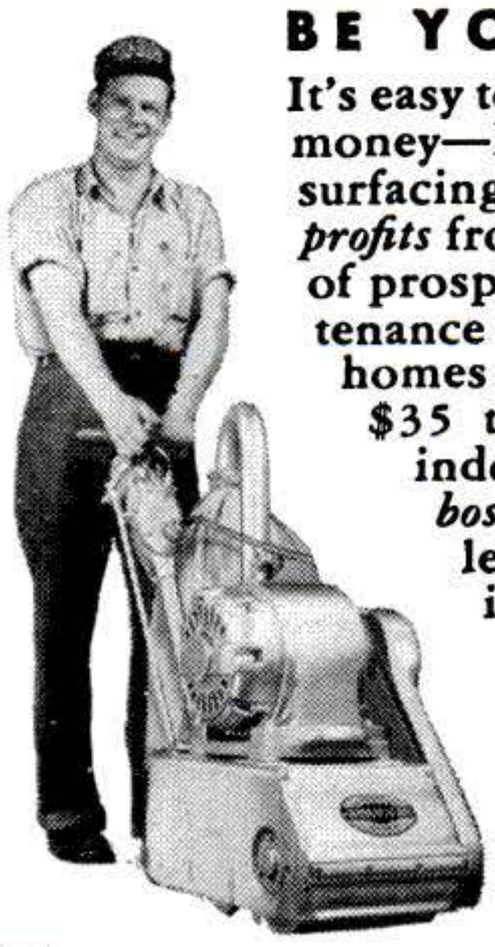

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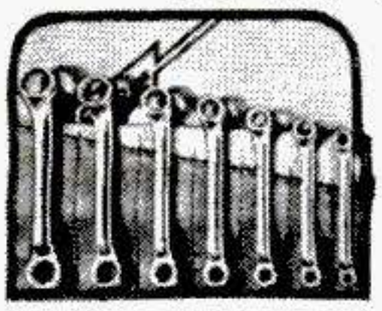
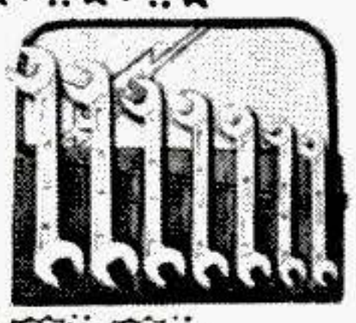
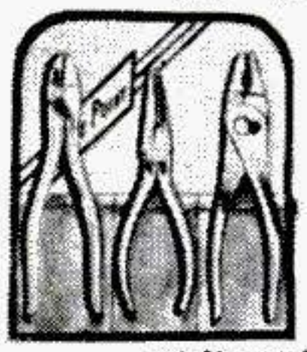
MASTER SUPREME WRENCH SET
In handsome steel case, a full set of the most needed wrenches for general work. Four handles including ratchet and speeder—3 extensions—a universal joint and 15 sockets, sizes 7/16" to 1 1/4". **$42.95**



DWARF BOXOCKET SET
7 wrenches with 14 openings fit all nuts 5/16" to 13/16". Forged from toughest steel, accurately double broached to close tolerances. Polished chrome finish. In kit bag..... **$9.95**

OPEN END WRENCH SET
7 wrenches with 14 openings, heads set at 30° and 60° angles to turn hardest-to-reach nuts in 3/8" to 3/4" sizes. In leatherette kit bag..... **$10.05**





BASIC PLIER SET
3 basic pliers most often used in everyday work. 7" diagonal cutters—6" needle nose — 7" gripper-cutter — all finely finished precision tools in handy kit bag..... **$11.05**

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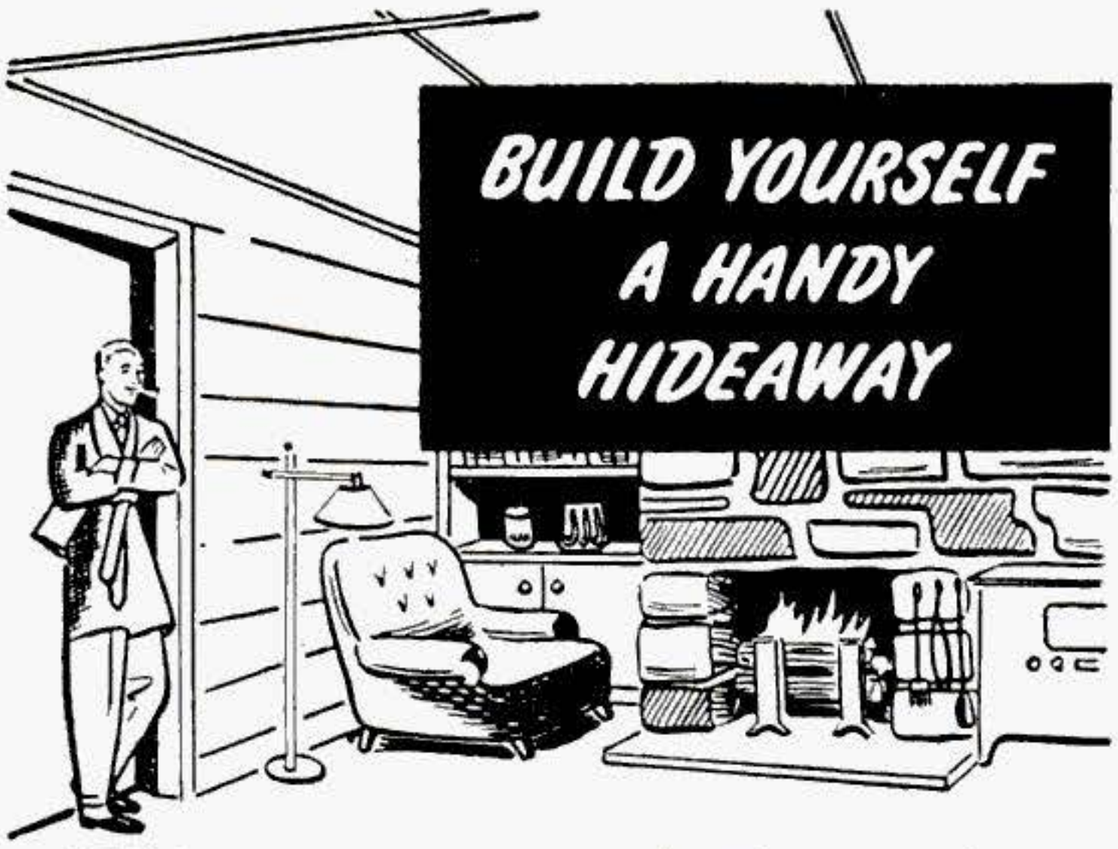

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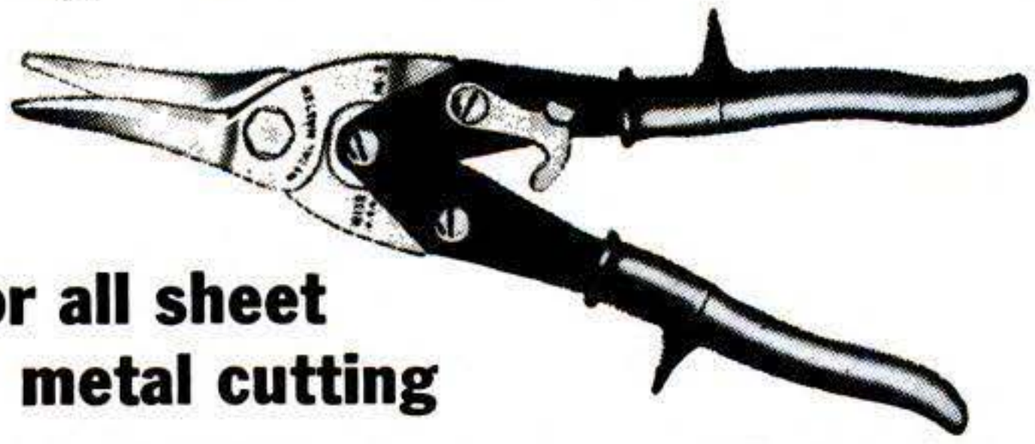

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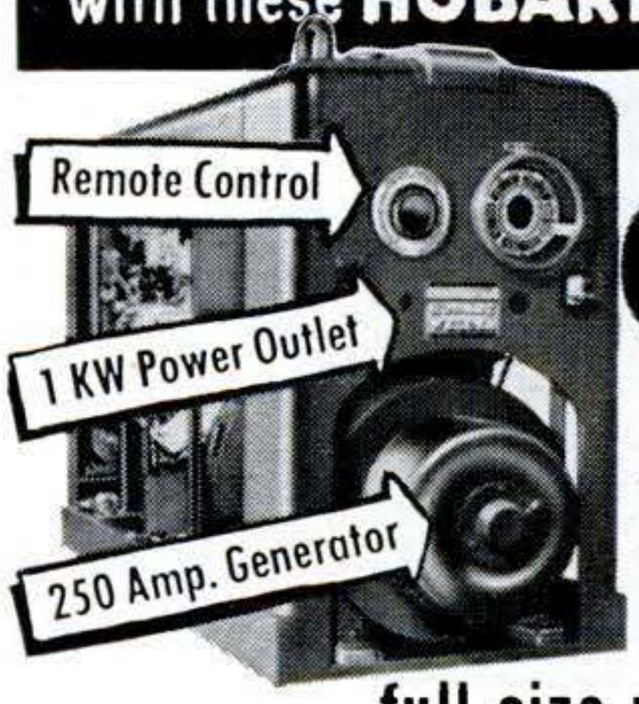

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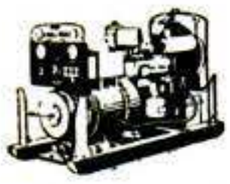

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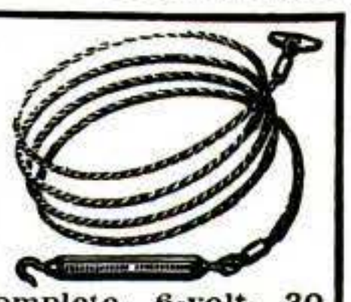

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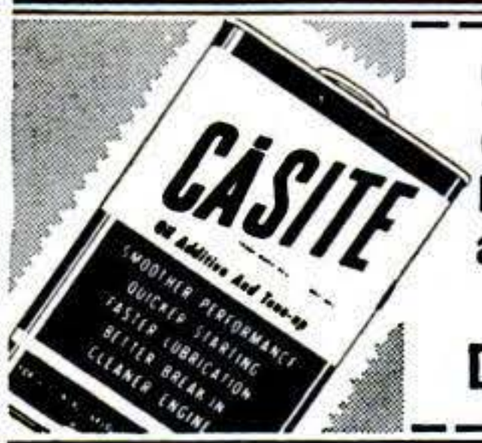

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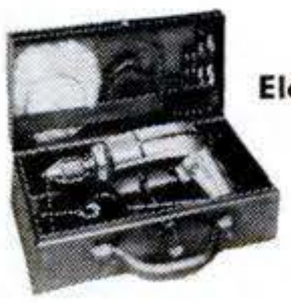

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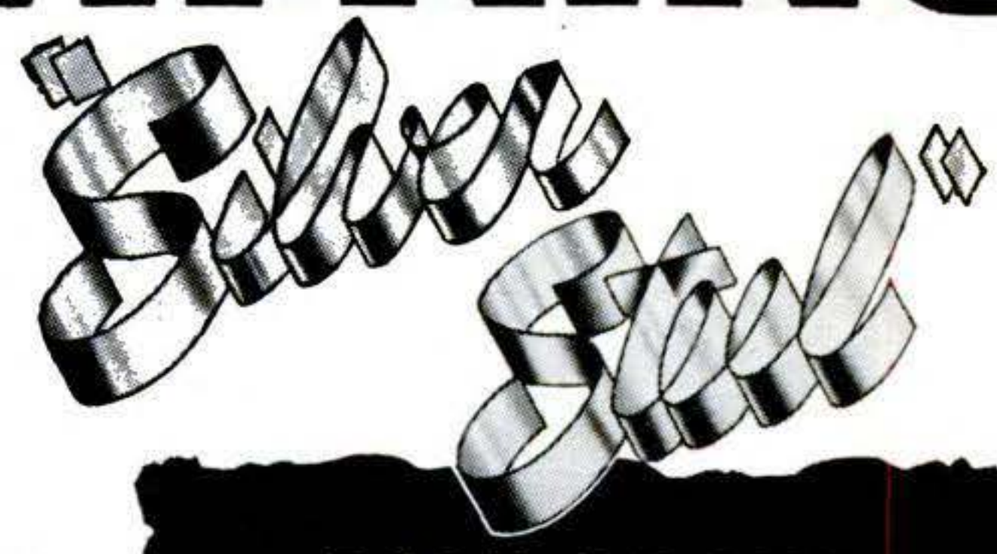

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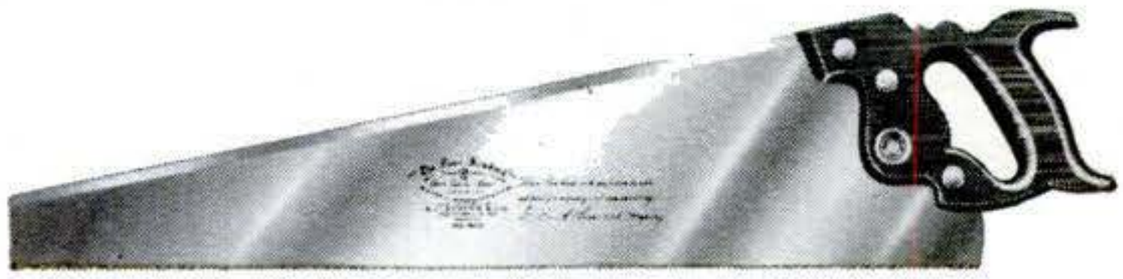

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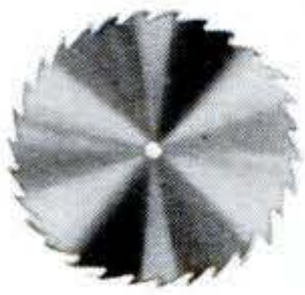

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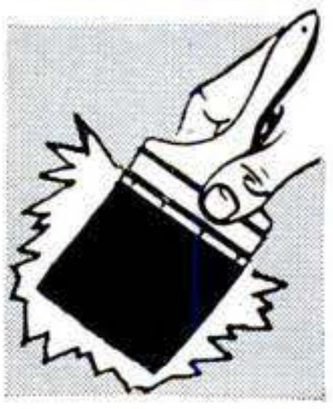

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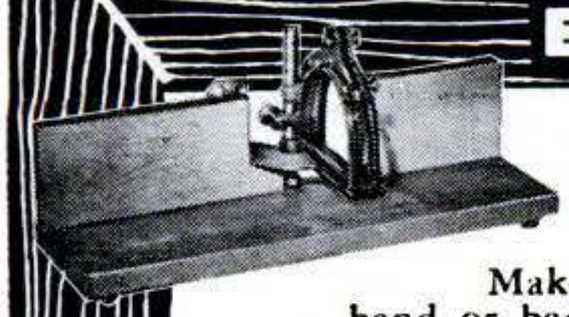

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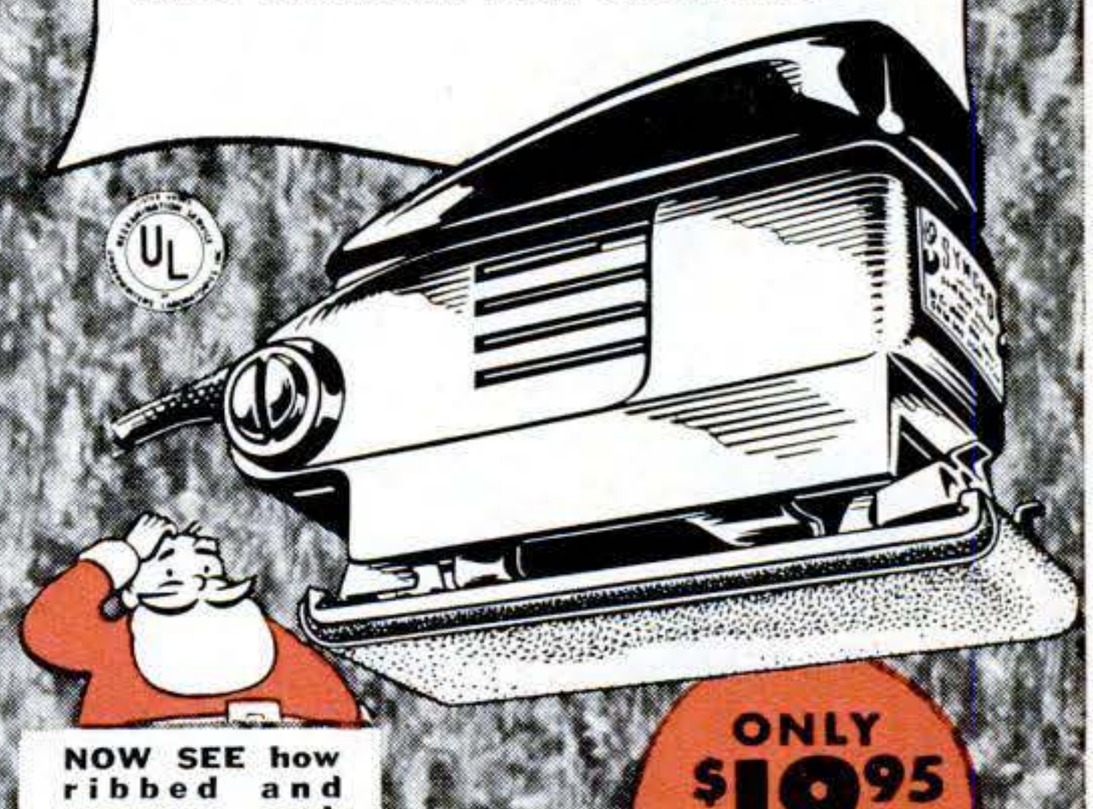

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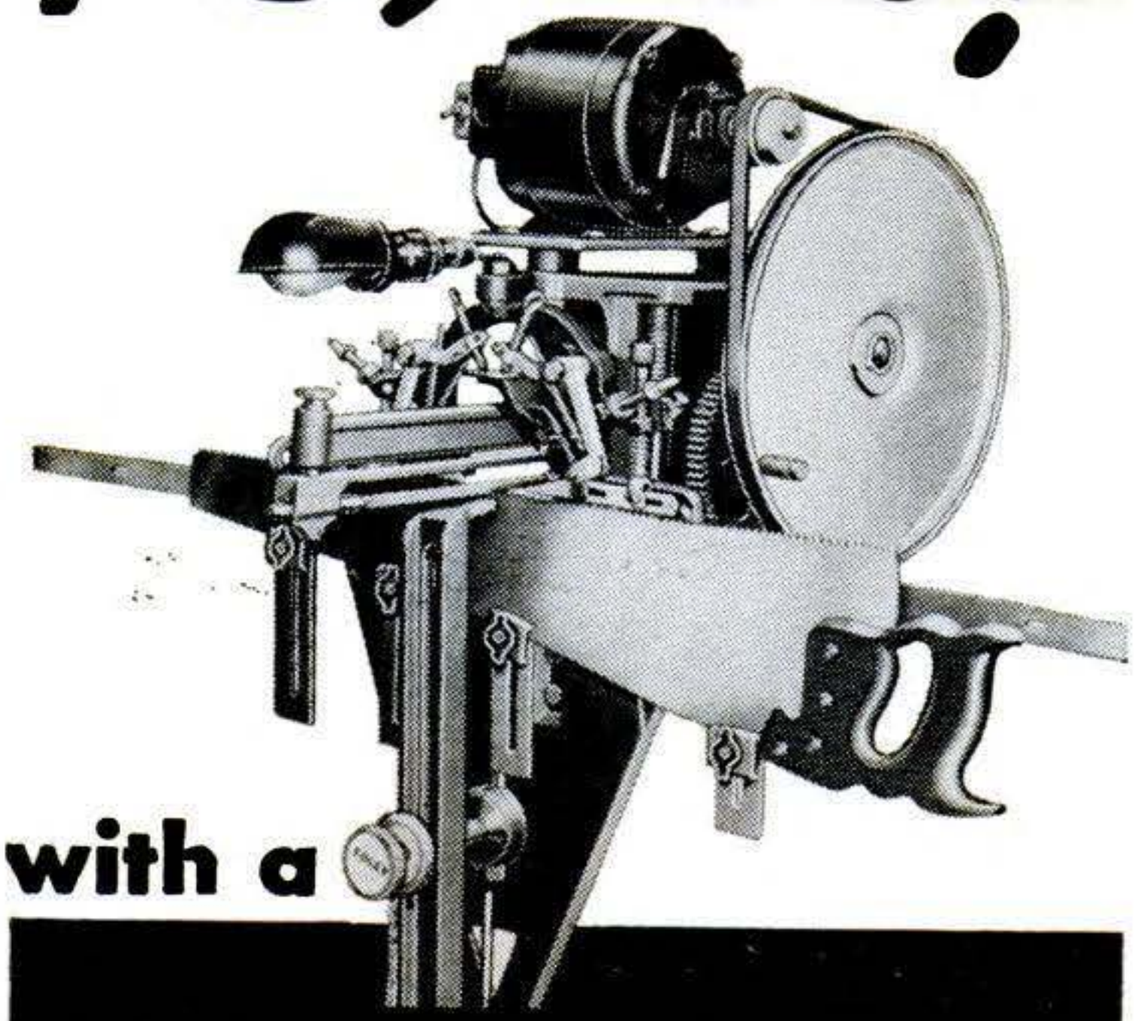

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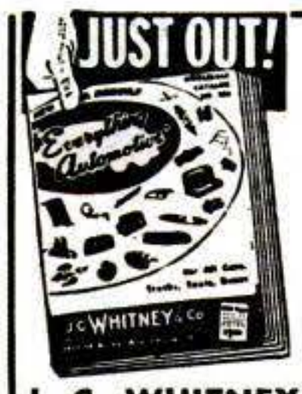

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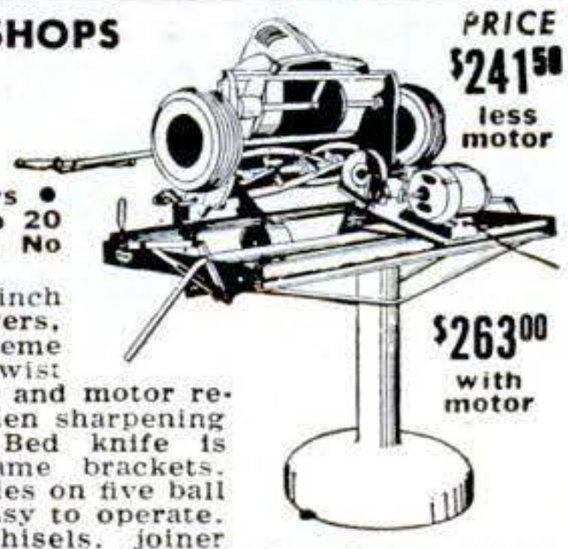

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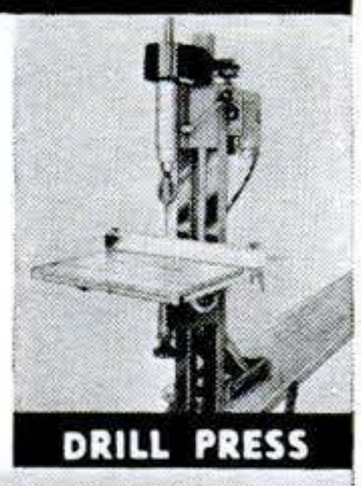

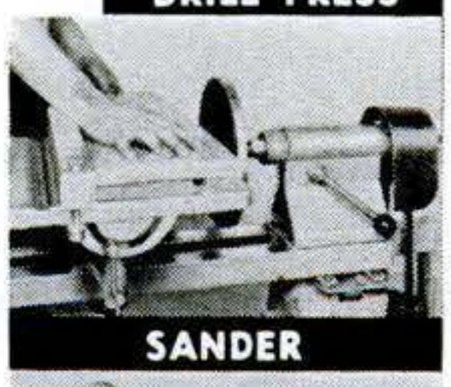

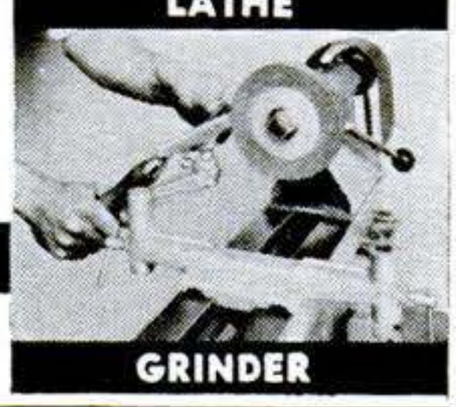

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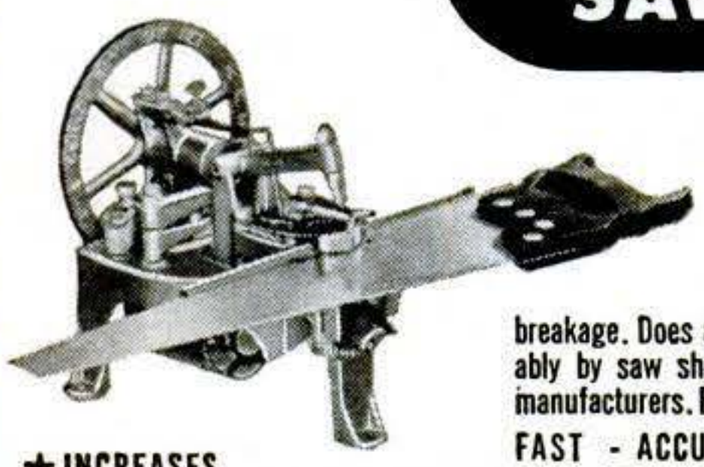

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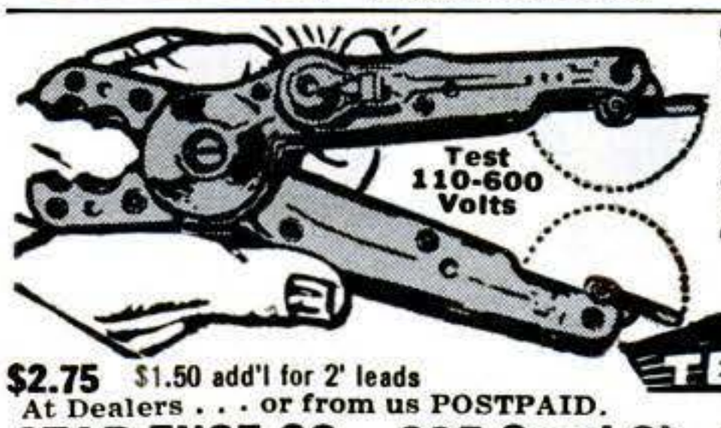

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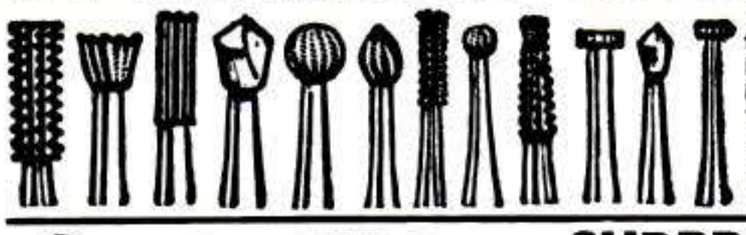

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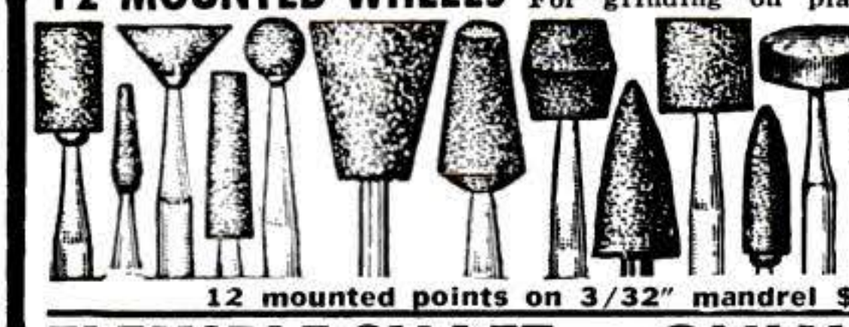

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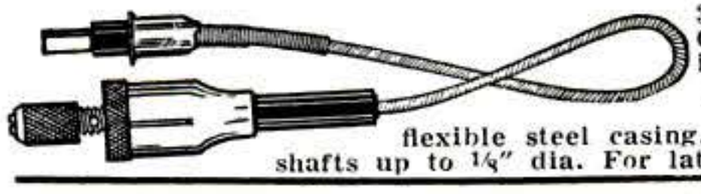

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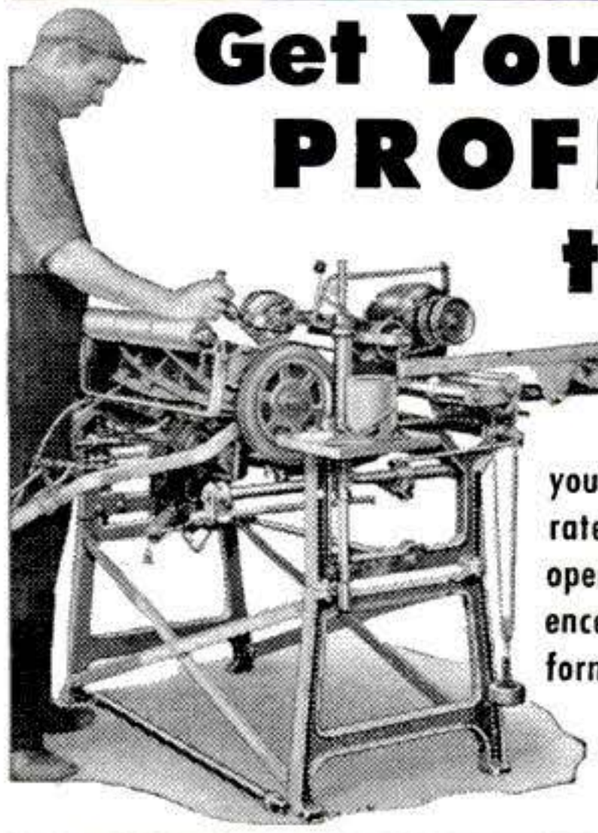

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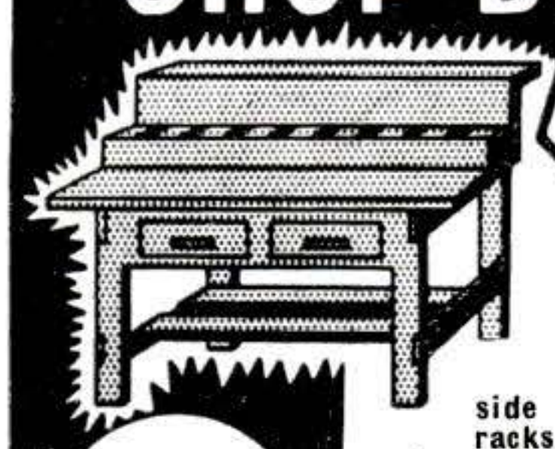

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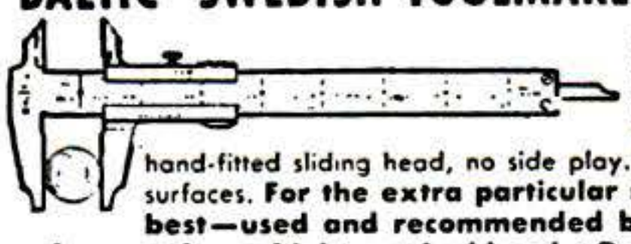

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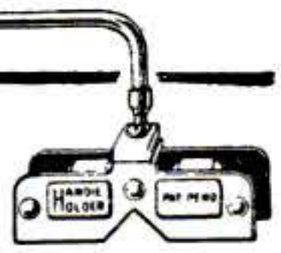

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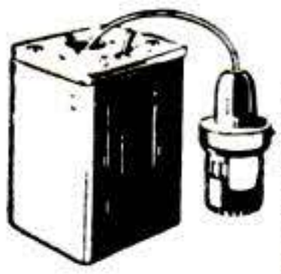

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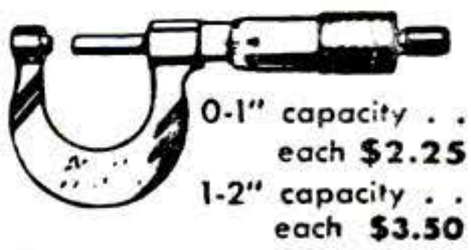

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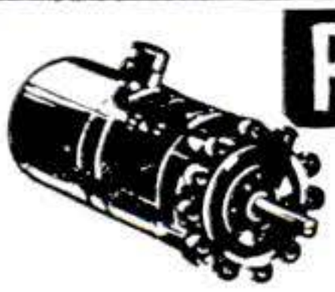

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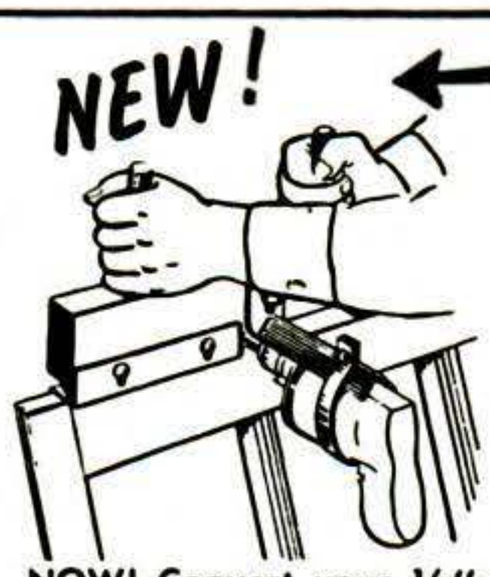

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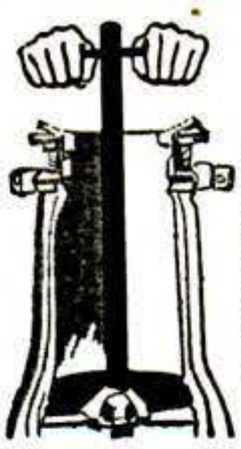

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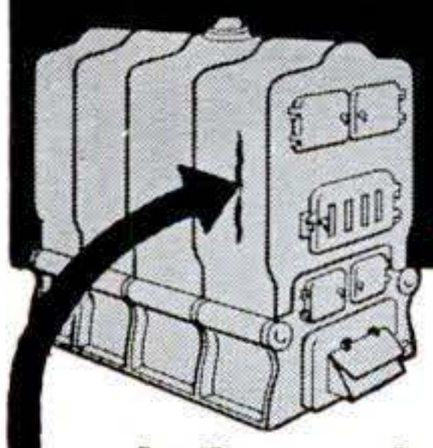

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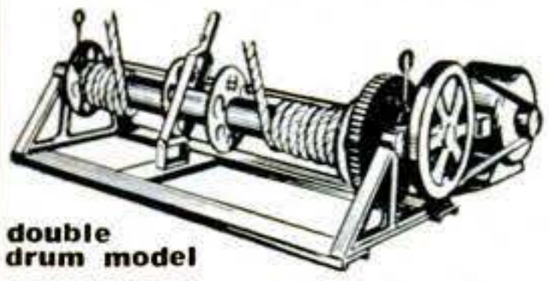

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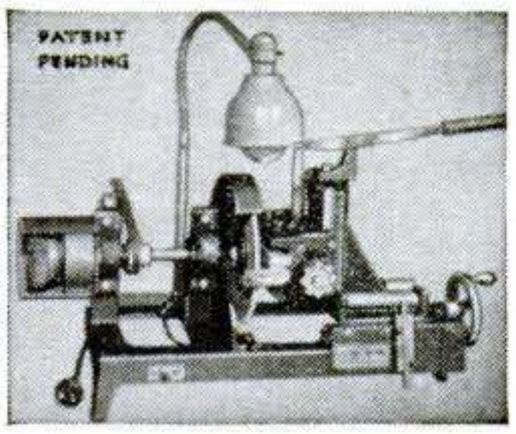

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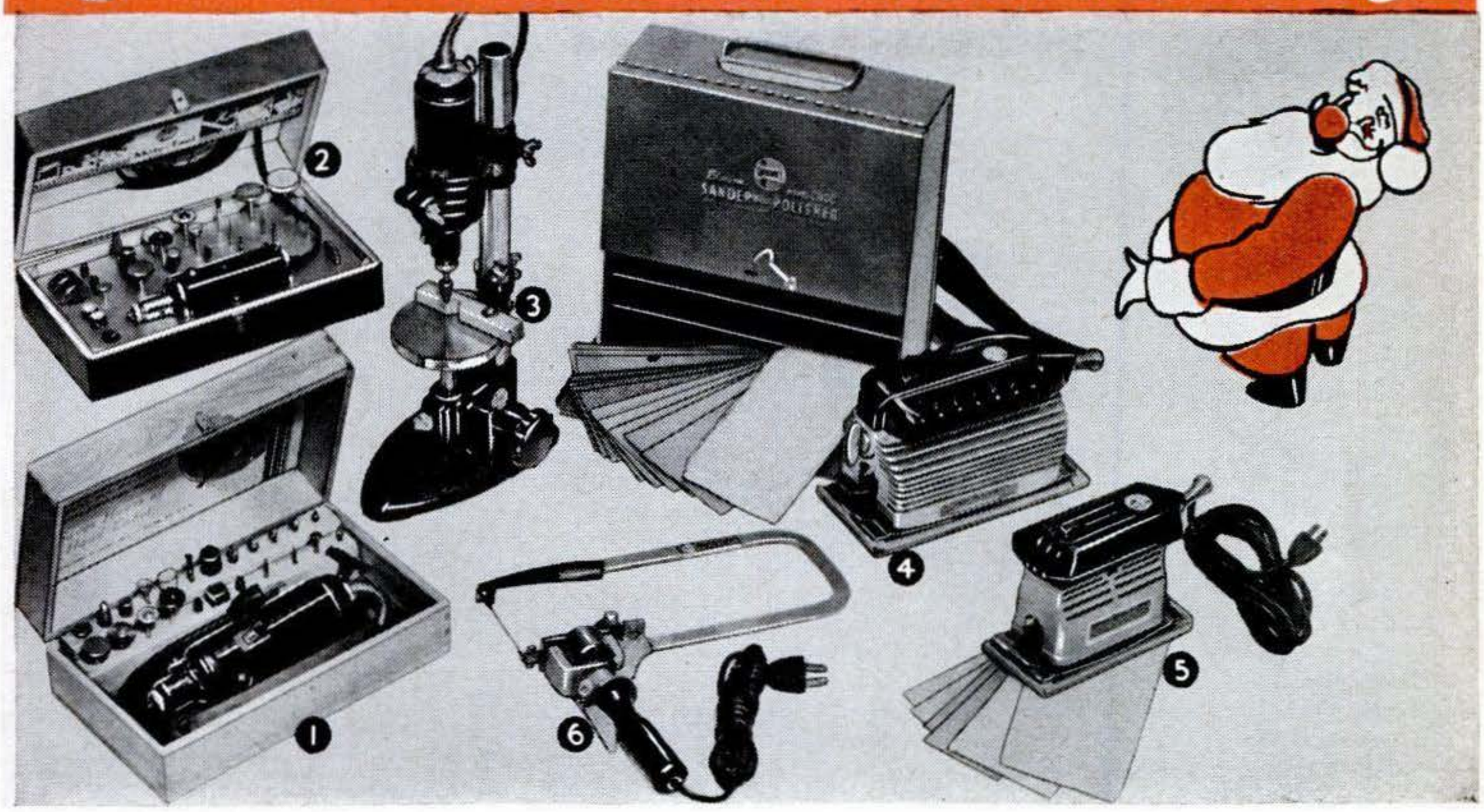

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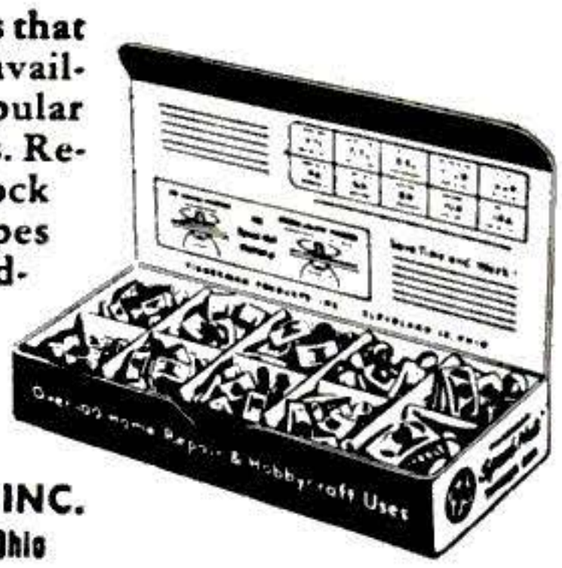

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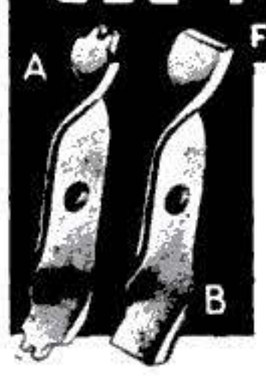

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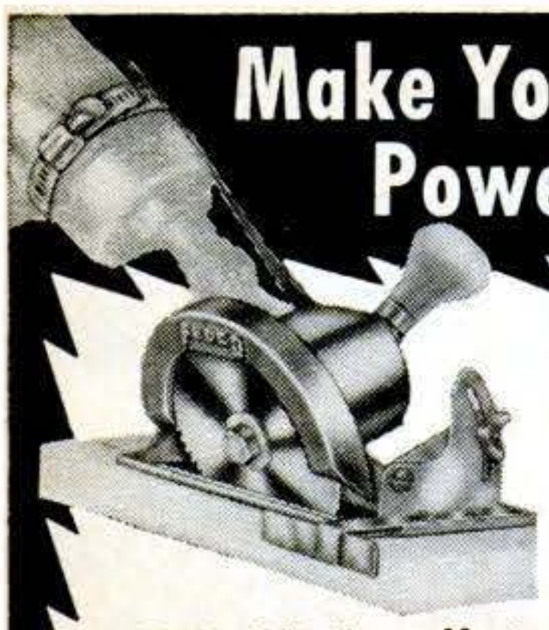

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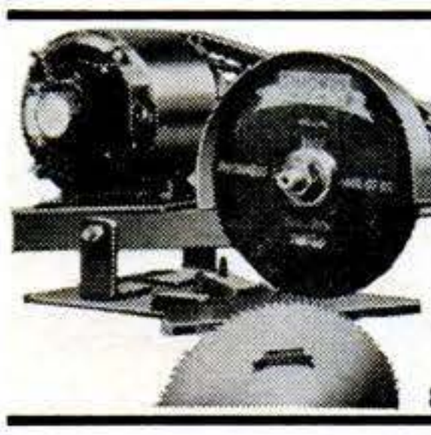

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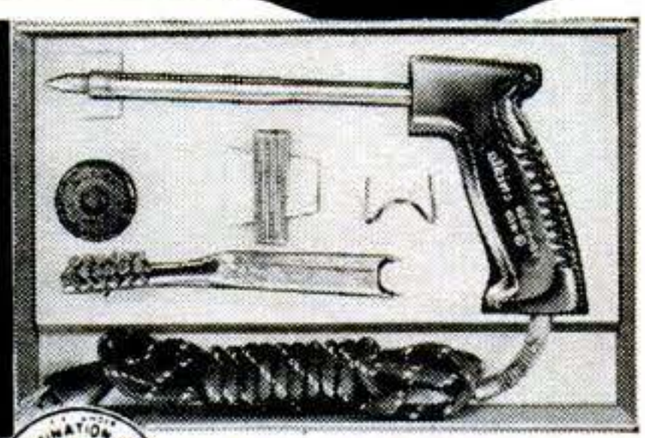

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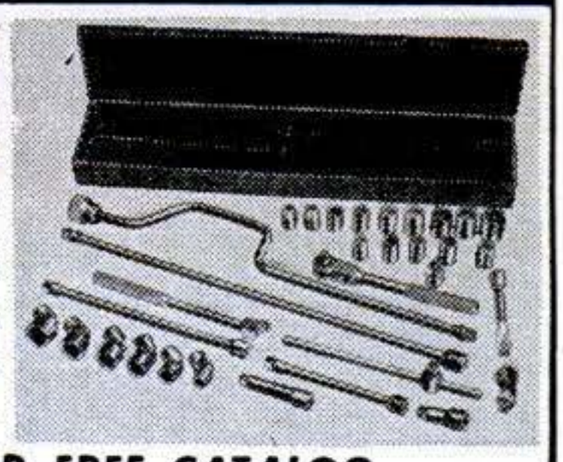

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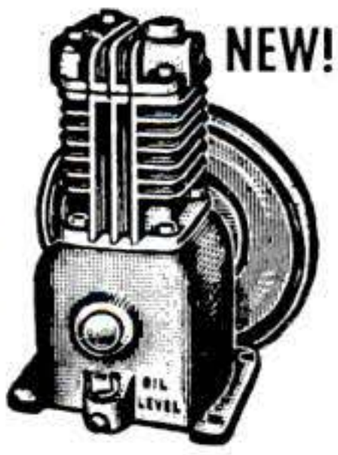

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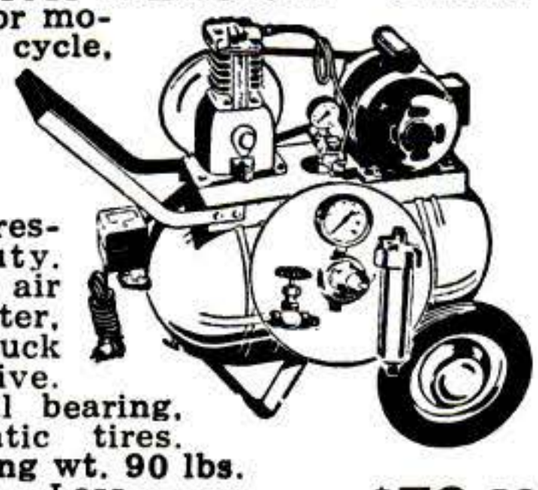
AUTOMATIC COMPRESSOR UNIT



⅓ H.P. heavy duty capacitor motor. AC 110/220 volt, 60 cycle, 2x1¾ inch piston type compressor, splash feed lubrication. 12x24 inch tank, automatic pressure switch. CFM 2.8 at 100 lb. pressure, or 150 lbs. pressure for intermittent duty. Check valve, safety valve, air regulator with gauge and filter, 20 ft. air hose with air chuck for inflating tires. V. belt drive. Mounted on 2 wheels, ball bearing, with 2"x10" semi-pneumatic tires. Portable with handle. Shipping wt. 90 lbs.

With ⅓ h.p. motor **$160 Value.** **$98.50**
With ½ h.p. motor..... **$109.50**
Compressor only..... **$20.50**
Less Motor..... **$79.50**
With 1½ h.p. gas engine.... **$124.50**
Regulating gauge and filter..... **$8.95**

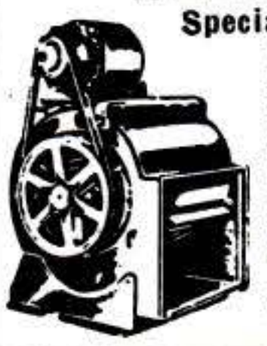
WELLWORTH V-BELT CLUTCH

BRAND NEW

Takes starting load off engines or motors. When speed is reached, a flip of handle shifts clutch from idling to driving position. Handles "A" belts, 2.35" pitch diameter, ⅝" bore. Ideal for use with lawn mowers, garden tractors, home workshop motors, etc. 3¼" long. Safe, easy to mount, sealed bronze bearings, positive action. Shpg. wt. 3 lbs. **$7.50**

BUSHING FOR ½" SHAFT 15c

"WELLWORTH" BLOWER BARGAIN



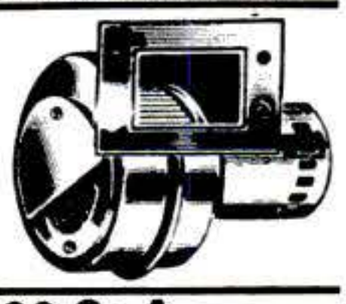
Special price to dealers in lots of 5 or more. Write us.

BRAND NEW. Quiet operating. Double wheel inlet, double width blower. For heating, ventilating, cooling, air washing, exhausting and forced draft. DIMENSIONS: 10" wheel; outlet 13⅛" x 11⅜"; inlet 8¾". Height 19". Width 18". Depth 16½". C.F.M. ¼" S.P. 1600; outlet vel. 1575. Wt. 45 lbs.

BLOWER LESS MOTOR AND DRIVE..... **$27.50**

With belt and variable speed pulleys, $2.50

140 CFM "WELLWORTH" BLOWER



5⅛"x4" mounting flange with 2½" square discharge, 3½" dia. blower wheel powered by direct-connected 1/15 H.P., 110 V. 60C., A.C. motor with conduit box and 20" leads, 7½" wide less flange by 7¼" H. x 6¾" D. Shpg. wt. 6 lbs..... **$16.20**

50 CFM Blower, 2½" discharge....**$10.95**

Save $10.00 On A

DRILL-O-MATIC
Electric Polisher and ¼" Drill

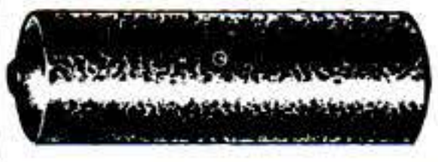
Polishes floors, furniture, automobiles; does sanding, drilling, and buffing jobs. Handy family Work-Aid. Limited number available. Act fast. Drill and Polisher combination. 110 Volt AC-DC. Disc Polishing Bonnet; ¼" Jacobs chuck; horizontal bench stand; 42" polishing handle; wire wheel brush, 2-mounted wheels; 2-drill bits; spindle adaptor, buffing wheel, 6-abrasive discs; 1-grinding wheel; paint mixer; 12 ft. cord & plug; drill handle; steel hinged carrying case with handle and lock clamp. Wt. 9 lbs. 24 pieces. Ideal gift.

50,000 were sold at $28.95.
Our special price, only..... $14.95

AIR TANK AND ACCESSORIES

Brand New steel 6"x24", 400 lb. test. Ideal wherever compressed air is needed. Equipped with 500 lb. combination air gauge and inflation valve with core for retaining pressure in tank; tire chuck, 3 ft. high test air hose.

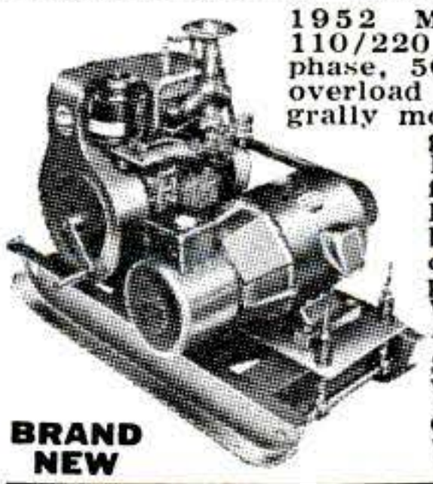
Ship. Wt. 12 lbs.
Complete outfit **$7.95**



"Wellworth" Pressure Tank

7" x 25" Welded Steel. ⅜" opening on each end. ¼" and ⅜" opening at centers. Convex Head and Bottom. 100 lbs. working pressure.
Shipping Wt. 17 lbs..... **$9.75**
Same Tank, 9"x27", wt. 28 lbs. **$14.50**

BARGAIN LIGHT PLANT

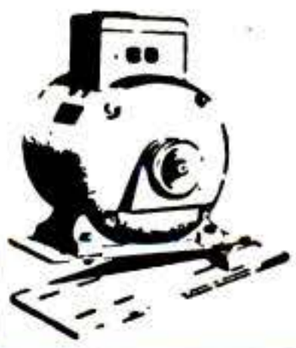


BRAND NEW

1952 Model. 5000 watts. 110/220 volts. 60 cy. AC, one phase, 50 amps. Takes starting overload up to 87 amps. Integrally mounted separate exciter giving exceptional overload and surge capacity for starting motors. Drip-proof constr. Ball bearing, lifetime lubrication. Voltmeter, 2 plug-in receptacles. Wisc. air cooled, 2 cyl. 4 cy. 10½ HP engine.

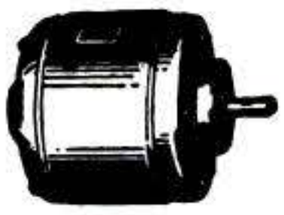
Special Price Wt. 575 lbs. **$525**
Generator only Wt. 225 lbs. **$325**

GENERATORS
. . . Big Values



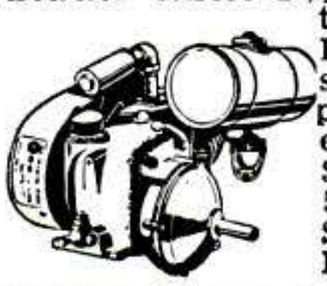
500 to 750 watt, A.C., 110-120 volt, 60 cycle, 1 phase output. Also 100 watt D.C. battery charging output. May be used at the same time. Voltmeter, 2 outlet boxes. Wt. 55 lbs. Price..... **$99.50**
Furnished with 1½ HP Engine with drive **$142.50**

1/12 H.P. MOTOR



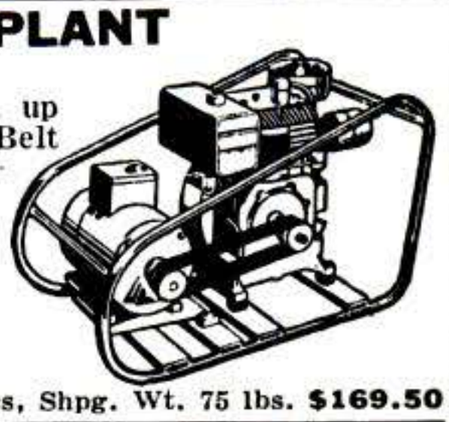
Delco 110-V, 60 cy. A.C., 1 phase 1750 r.p.m. 2 amps., will take 50% overload. Shaft 1⅜ x 1¼. Heavy duty, bronze sleeve bearing. Size 6" long, 5" high, net wt. 12 lbs. List $21.00.
Special **$13.50**
Lots of 3, ea. **$12.50**

Red Seal Continental Gas Engine



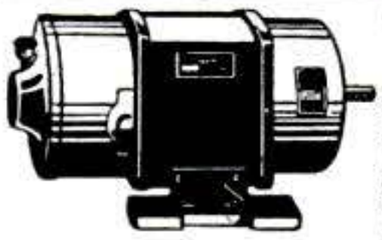
BRAND NEW. 1½ HP with 6 to 1 reduction gear. Operates at 450 R.P.M. For lawn mowers, scooters, garden tractors, pumps, compressors, generators, etc. List Price $79.50. Shipping weight 54 lbs.
SPECIAL PRICE..... **$47.50**

2000-2500 WATT LIGHT PLANT
Heavy Duty Windings



110 v., 60 cy., A.C., takes starting overload up to 5000 watts. Floating Base for Automatic Belt Adjusting, 2-Groove Engine Pulleys, V-Belts, Bolts, etc. 5 H.P. Wisconsin or Briggs & Stratton Model 14 Engine. Voltmeter, 2 plug-in receptacles. Portable Tubular Steel Skid Type Carrier. Dim. L 34⅝" x W 17" x H 20".
Wt. 180 lbs. **$299.50**
Same unit less mounting base.....**$275.00**
Generator only with voltmeter, 2 plug-in receptacles, Shpg. Wt. 75 lbs. **$169.50**

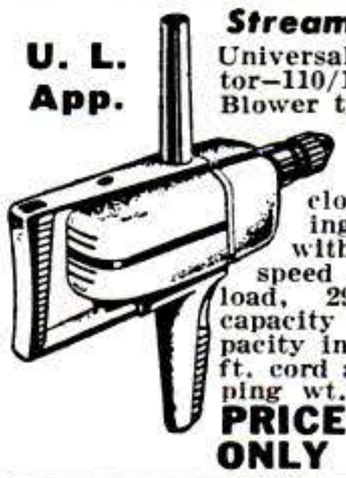
LELAND GENERATORS



2500 watts, 110 v. 60 cy. single phase 1800 r.p.m., self excited, fungus treated for long life. 1951 model. Brand new, in original factory crate. Shpg. wt. 135 lbs. List $375. Special price.. **$237.50**

Furnished with 6½ H.P. Briggs & Stratton gas engine (or equal) with drive. Wt. 251 lbs. List $750. Special price..... **$395.50**

½" ELECTRIC DRILL



U. L. App.

Streamline Design

Universal air-cooled motor—110/115 V. AC-DC Blower type fan for air cooling. Removable side handle for close quarter drilling. Jacob's Chuck with key. No load speed 450 RPM; full load, 290 RPM. ½" capacity in steel; 1" capacity in hard wood. 10 ft. cord and plug. Shipping wt. 11 lbs.

PRICE ONLY **$35.50**

Portable ELECTRIC HAND SAW
The Zip Sawer With ALL the Features

BRAND NEW

6¼" Diameter saw blade, ½" square arbor hole. Maximum depth of cut 2⅛". (At 45°, 1¾".) Minimum depth of cut 0". Angular adjustment 90° to 45°. No-load speed, 5200 r.p.m. Full load speed, 3200 r.p.m. Amperes, full load 8.0. Universal AC-DC motor, 110/220 volt. Dimensions: 11¼" long; 9½" wide (ripping guide removed); 7⅛" high (without blade). Furnished complete with 6¼" diameter combination blade and 10 ft. cord and plug. Wt. 11½ lbs. Price.. **$44.50**

WELLWORTH PAINT SPRAY UNIT

Wellworth 2 cylinder, piston type with 110 volt, 60 cy., A.C.-D.C. Heavy duty motor. Built in tank provides even air flow; safety valve; syphon type gun with quart aluminum cup; sufficient pressure for continuous spraying of lacquer, enamel, paint, insecticides, etc. at 25 to 30 lbs.; 20 ft. air hose. Complete instructions. Wt. 12 lbs. 1 year guarantee.

$50.00 value
Price only **$22.95**

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Here's the book for owners of good quality but long-used pliers that need a bit of "first aid". Simple instructions (with pictures and diagrams) on how to put them back in good condition. *Saves you money—saves America precious steel.*

How to remove rust, loosen or tighten joints, straighten jaws, renew jaw checking, sharpen cutting edges, etc. *Good quality* pliers can usually be repaired readily.

Send today for your FREE copy of the 8-page booklet, "First Aid for Pliers".

And, of course, if you really *need* new pliers, remember the name UTICA when you see your hardware dealer.

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IT DRILLS IT SAWS IT REAMS

DRILL, SAW, REAM metal, pipe, wood, plastic, Transite, etc. Use with any electric drill slow drill press, lathe or milling machine Drills own starting hole—upper part of bit is used to cut, saw or ream circles, ovals, squares or scrolls. Easy to operate. Ideal for carpenters, mechanics, electricians, plumbers, hobby ists, many others Abrasive resistant, high speed steel. Flutes ground from solid. Will withstand severe continuous use without breaking. Resharpened at no charge. Takes place of up to $50 in tools ¼" diameter, 2" cutting sections, total length 3½" Also available specially designed for wood or metal and in 2⅜" and 1¾" lengths. Write for details Specify all-purpose bit Shipped same day. Money-back guarantee Dealer inquiries invited

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AMAZING 12¼-IN. PLANER Does All Ordinary Planing Mill Jobs. Provides attachments for Jointing, Rabbeting, Tongue, Groove, Matching. 12¼ x 6-in. capacity, 3-knife solid round all-steel cutterhead. Power feeds at 24 feet per minute, 42 cuts per inch. Provides for full line of accessory attachments—Grind and Joint knives IN THE CUTTERHEAD WITHOUT REMOVING.

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SELECT-A-CHARGE REGULATOR

WITH DASHBOARD CHARGE CONTROL

FOR BETTER GENERATOR AND BATTERY SERVICE - LONGER - BRIGHTER LIGHTS WHEN YOU WANT THEM. GUARANTEED.

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Motor driven **$9.75** complete with vise

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$300 VALUE—ONLY $97.50

200 Amperes Continuous Duty. Up to 250 amps. intermittent duty. Easily mounted on your tractor. Welding range from 0-up by dial type control. 1-yr. guarantee with money back 10-day trial period. Write for FREE literature. OR send 35c for PLAN "Build Your Welder from Aircraft Generator". Write today.

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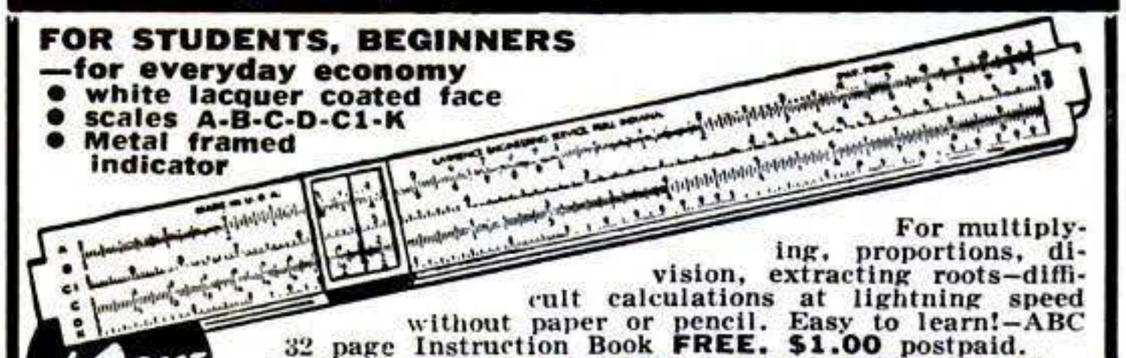
New Accurate 10" SLIDE Rule

FOR STUDENTS, BEGINNERS
—for everyday economy

- white lacquer coated face
- scales A-B-C-D-C1-K
- Metal framed indicator



For multiplying, proportions, division, extracting roots—difficult calculations at lightning speed without paper or pencil. Easy to learn!—ABC 32 page Instruction Book **FREE. $1.00** postpaid.

Professional Model: Scaled A-B-C-D-C1-K-S-L-T

- Contact hairline index on back of rule insures accurate reading of "trig" Scales. With Leather Case, instruction book. **Complete. $2.00** postage paid.

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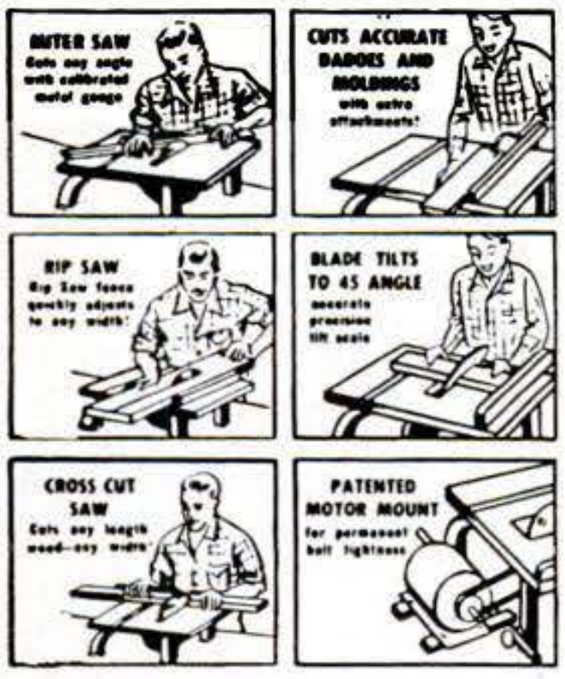
ALL METAL 8" TILT-ARBOR SAW

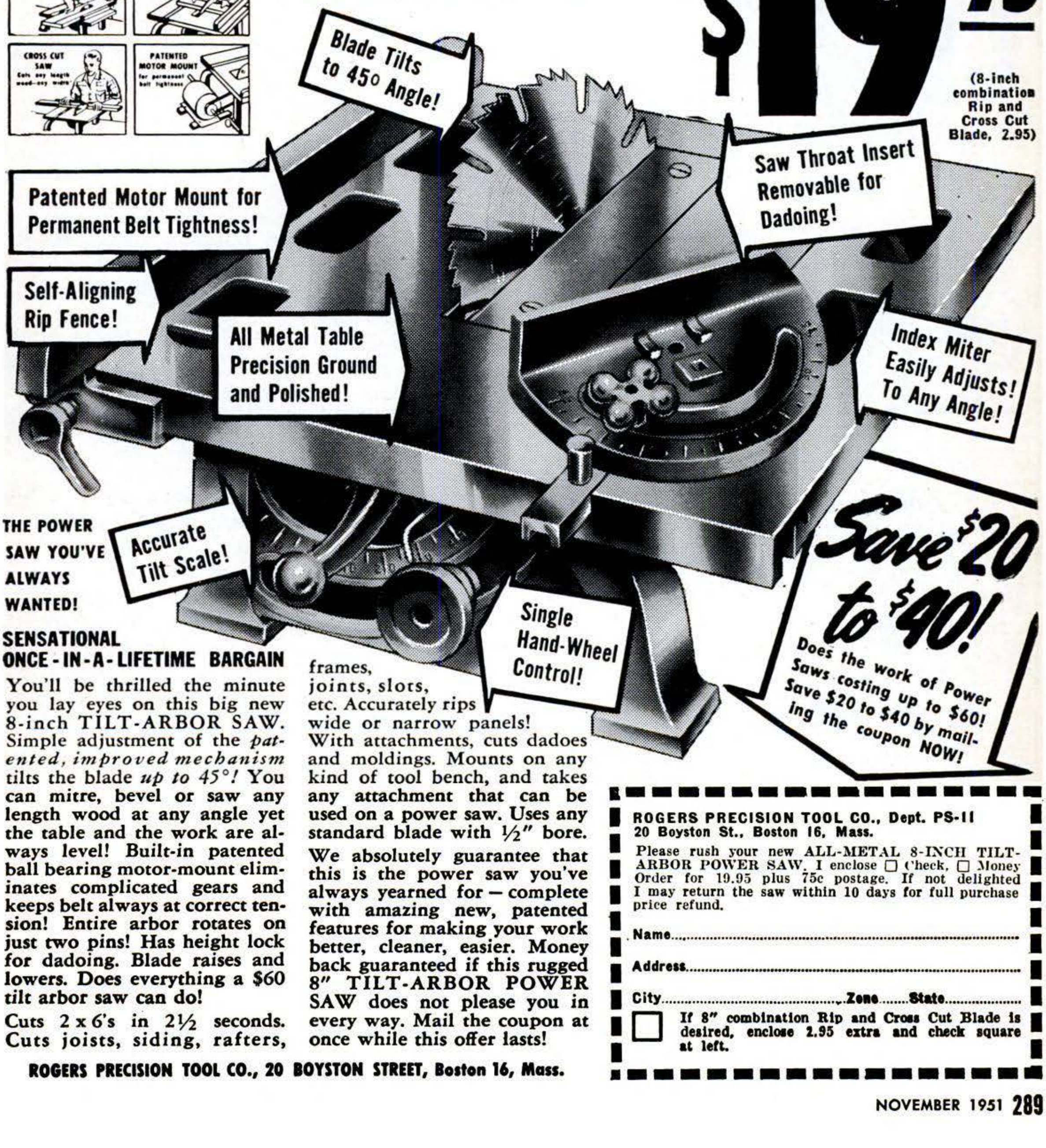


- BLADE TILTS TO 45° ANGLE! TABLE STAYS LEVEL!
- STURDY ALL METAL CONSTRUCTION!
- PRECISION GROUND AND POLISHED TABLE!
- BALL BEARING BUILT-IN MOTOR MOUNT!
- CUTS HARD OR SOFT WOODS—UP TO 2½" THICK!
- OPERATES ON ¼ OR ⅓ h.p. MOTOR!

AN AMAZING BARGAIN AT ONLY

$19.95

(8-inch combination Rip and Cross Cut Blade, 2.95)



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Save $20 to $40!

Does the work of Power Saws costing up to $60! Save $20 to $40 by mailing the coupon NOW!

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You'll be thrilled the minute you lay eyes on this big new 8-inch TILT-ARBOR SAW. Simple adjustment of the *patented, improved mechanism* tilts the blade *up to 45°!* You can mitre, bevel or saw any length wood at any angle yet the table and the work are always level! Built-in patented ball bearing motor-mount eliminates complicated gears and keeps belt always at correct tension! Entire arbor rotates on just two pins! Has height lock for dadoing. Blade raises and lowers. Does everything a $60 tilt arbor saw can do!

Cuts 2 x 6's in 2½ seconds. Cuts joists, siding, rafters, frames, joints, slots, etc. Accurately rips wide or narrow panels! With attachments, cuts dadoes and moldings. Mounts on any kind of tool bench, and takes any attachment that can be used on a power saw. Uses any standard blade with ½" bore.

We absolutely guarantee that this is the power saw you've always yearned for — complete with amazing new, patented features for making your work better, cleaner, easier. Money back guaranteed if this rugged 8" TILT-ARBOR POWER SAW does not please you in every way. Mail the coupon at once while this offer lasts!

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Please rush your new ALL-METAL 8-INCH TILT-ARBOR POWER SAW. I enclose ☐ Check, ☐ Money Order for 19.95 plus 75c postage. If not delighted I may return the saw within 10 days for full purchase price refund.

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☐ If 8" combination Rip and Cross Cut Blade is desired, enclose 2.95 extra and check square at left.

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GASOLINE MODEL with easy starting 2 hp. 4-cycle engine (Item 73) **$159.50**
SELF PROPELLED MODEL for large areas (2½ hp. engine) (Item 74) **$229.50**
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We pay freight on Snow-Blos. Free with purchase of any model, an extra 100′ extension cord.

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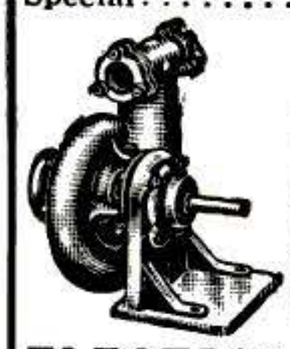
(Item 61) Operates equally well on gas or ordinary alcohol. Economical. 1 pt. burns for hours. Produces intense blue smokeless flame. Ideal for lab. or as emergency cooking unit. Fine for camping. Heavy brass burner with shut-off and adj. valve. Simple and safe. 5 ft. flex. hose, 1 qt. tank incl. Wt. 5 lbs. A $15 value. Special **$4.95**

GEM CUTTER (Item 49) Complete Prof. Lapidary mach. for cutting, shaping, grinding and polishing precious and semi-precious stones. Precision built with big horiz. power driven gem cutter, built-in cutting lubricator; genuine 6″ supercharged diamond saw, lap wheel, abras. whls., 2 scratch whls., 4 felt whls., grinding and polishing compounds, brushes, dope cement and sticks, cutting oil, ext. cord, asstd. gems, complete instructions. Requires ¼ hp. motor (not incl.) Wt. 22 lbs. Worth $99.50. Our Special **$39.95**

G. M. HI-FLO PUMP



(Item 56) **210 gal. per min.** Centrifugal turbine type. Unexcelled for fire-fighting, irrigation, sprinkling systems, swimming pools, drainage, fuel transfer, etc. Built by GM for the Army at a much, much higher cost. Tremendous volume, will deliver 210 gpm with 5.3 hp. down to 40 gpm with 1½ hp. 2½″ stand. pipe thr. inlet (can be reduced to 2″ if desired). Twin 1¼″ outlets. Dynamically balanced, ¾″ shaft, hi-speed ball bearings. Easy fast priming (instr. incl.) Wt. 36 lbs. Sensational value **$39.50**

ELECTRIC WATER HEATER

(Item 76) Immersion type 115 v AC—1250 watts. Convert your present tank to modern automatic hot water heater. Long life Westinghouse or Chromalox element screws into std. 1¼″ opening in tank. Adjustable thermostat keeps water at desired temp. Can also be used in washing machine or tub. Wt. 8 lbs. Heater element and thermostat regularly $49.50 Spec. **$14.95**
Heater Element only, Wt. 3 lbs. **$7.95**

ANGLE DRILL

(Item 23) Fits into chuck of any electric or pneumatic drill or flex. shaft. **Operates at any angle in a full 360° arc.** Makes possible drilling, grinding, carving, routing, etc. in close cramped quarters. Makes impossible jobs easy. Made by Kett Tool Co. Complete with built-in chuck (¼″ capacity) and adjusting key. Hardened alloy gears. Precision built for heavy duty. Lists at $39.95— while they last **$9.95**

TIRE CHAINS (Item 43) Extra heavy for dual truck tires, 7.50x20, triple side links, made by Intl. Chain. Reg. list $57.50—our spec. **$19.50**

A-C ARC WELDER

Master Hi-Line A-C Arc Welder, 20-190 amp. output. (Item 168). Welds or cuts iron, steel, brass, etc. from 24 gauge to ⅝″ with single pass. Operates from 220/230 V. 50/60 Cycle A-C line. None better. Meets REA requirements. Handles 1/16″ to ¼″ rods. Adjustable output for any job. In sturdy steel cabinet, on casters. Full instru. and 1 yr. guar. incl. Wt. 210 lbs. Reg. $250 value **$159.50**
(Item 169) 20-100 amp. A-C Welder operates on 110 or 220 V. Wt. 65 lbs. Worth $125 ..... **$64.95**

(Item 181) Welding Kit incl. helmet, 2 leads, electrode holder, ground clamp, power cord and rods (sold only with welder) Wt. 12 lbs. **$12.50**

CLIP BOARD (Item 17) Heavy Masonite, with self-adjusting spring hinge to hold up to 100 sheets of 8½x11 paper. Push back cover for instant release. Flip cover shut and notes or drawings are protected. Perfect for pilots, engineers, students, artists, truck drivers. Wt. 2½ lbs. Usually $2.95. Spec. $1.10. 2 for $2.00.

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All items brand new. Prices F.O.B. Chicago area.
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Gas-Plating Process Now Rivals Electroplating

Gas plating, under development during the past three years, is proving a novel and successful way of applying metal coatings. Unlike electroplating, it needs no electric current or liquid baths.

Objects to be plated are simply placed in a chamber containing a gaseous chemical compound of the metal to be applied. Heat decomposes the compound and rapidly deposits a coating of the pure metal, which may be nickel, chromium, iron, tungsten or molybdenum.

Carbonyl Compounds Used

The process makes use of an unfamiliar and interesting family of metallic chemicals called the carbonyls. An example is nickel carbonyl, whose chemical formula is written as $Ni(CO)_4$. It is formed when metallic nickel combines successively with oxygen and with carbon monoxide. In commercial form, nickel carbonyl is a volatile liquid supplied in steel cylinders. Bubbling inert gas through it fills a plating chamber with its vapor. A temperature of about 356° F. decomposes the nickel carbonyl into nickel and carbon monoxide gas, and the metal is deposited in a film. Apparatus has been developed to apply the coating to articles on a production-line basis.

Gas plating yields a metal coating in a small fraction of the time required by other methods. Nonconductors of electricity can readily be plated, including paper, plastic and tile; and semi-transparent nickel mirrors have been produced upon plate glass. Another advantage of gas plating is that irregular surfaces and interior parts of objects can be plated without special equipment. Both nickel carbonyl and carbon monoxide are poisonous, and nickel carbonyl is also explosive when mixed with oxygen, but these hazards can be overcome by proper equipment.

The technique of gas plating has been developed by the Commonwealth Engineering Co. of Dayton, Ohio.

Boiling Water Can't Get Hotter

You can raise the flame under your pot of coffee as high as you want, but the coffee won't get any hotter. The increased heat will turn more of the boiling liquid into vapor, but it can't increase its temperature.

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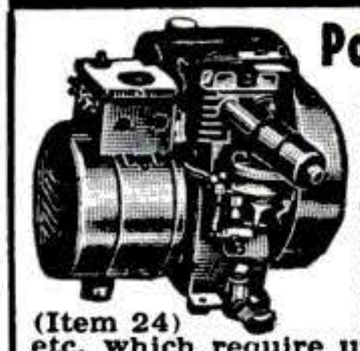
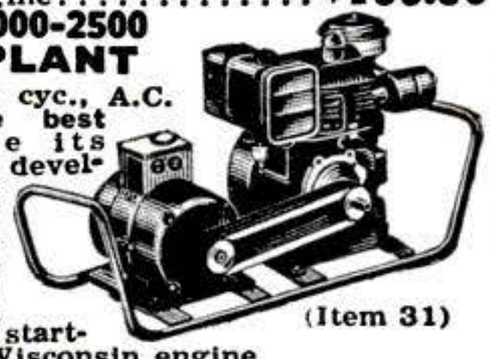


Portable LIGHT PLANT

PUSH BUTTON START

(Item 24) 500-700 watts 110-120 v. — 60 cyc. A.C. Powered by a sturdy dependable, easy starting, air cooled 1¾ hp. gas engine. No wiring necessary, just plug in and operate. Plenty of current for any oil burner, freezer, brooder, pump, emergency lights, etc. which require up to 700 watts. Ideal for Civil Defense, Fire Depts; trailers & camps. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries. Wt. 85 lbs. Fully guaranteed. **Be prepared if war or storm knocks out power lines.**
Reg. $275.00 value..... **$143.50**
700-800 Watt Plant (Item 44) same as Item 24, but greater output... **$169.95**
1000-1200 Watt Plant (Item 45) same as Item 24, but larger generator & engine..... **$199.50**

GIANT 2000-2500 WATT PLANT



(Item 31)

110-120 V. 60 cyc., A.C. **Absolutely the best made** because its heavy windings develop up to 5000 watt overload for motor starting. Skid-mounted—portable. Powered by 5 h. p. easy starting Briggs or Wisconsin engine —complete with all accessories; engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty and instructions included. Wt. 220 lbs. Reg. $585.00. Special at.... **$299.50**
GENERATOR ONLY and control box. Drive it with your engine or tractor **$169.50**

We Are World's Largest Mail Order Distributors of Light Plants

38 Pc. DRILL KIT

(Item 35) Includes hi-power smooth-running guar. ¼" drill, buffers, polishing bonnet, sanding discs, grinding wheels, wood bits, steel bits, wire wheels, bench stand, paint mixer, burrs, Complete in steel case. Wt. 13 lbs. 38 pc's., all highest quality. Complete kit worth $38.50. Our Spec. only... **$19.85**

ACCESSORIES FOR ¼" DRILL

Make complete workshop out of your ¼" drill, using these practical accessories. Quick change—merely insert shaft in drill chuck. Sturdy, heavy duty tools for real work. Precision built of hardened tool steel. Factory guaranteed against breakage.

POWER HACK or JIG SAW

(Item 64) makes straight or curved cuts easily in plywood, ¾" boards, sheet metal, plastics, etc. Uses broken hack saw blades. Will do filing, jig saw, coping saw and sabre saw work. Compares with $50 tools. Wt. 3 lbs. Special... **$16.95**

ELECTRIC HAND SAW

(Item 66)

(Item 66) The famous Arco-Saw converts any ¼" or ⅜" drill into a powerful electric saw. Exclusive features—one hand operation, visual guide bevel and angle adjustments, rip gauge depth gauge. Depth of cut 1-5/16". Self lubricated for life. Wt. 3 lbs. Complete with 4" blade..... **$11.50**

Power Sander & Polisher

(Item 65) Make quick work of slow tedious sanding jobs. Big 21 sq. in. sanding surface. Produces powerful **lengthwise** sanding stroke which results in beautiful smooth finish. Built-in rubber pad. Sandpaper held in place by quick-change spring-clips. No messy adhesives. Use felt pad for polishing. Using drill motor for power gives you equivalent of an $85 sanding machine. Wt. 3 lbs. Terrific value at... **$16.50**

FIRE EXTINGUISHER

(Item 39) Fully charged (at 1,000 lbs. P. S. I. or more) with CO2 (carbon dioxide), the proven miracle fire fighting chemical that smothers oil, gasoline and electrical fires. Play safe; keep one in your car, garage and home. Heavy ICC approved steel cylinder, valve and 3000 lb. gauge that shows available remaining pressure. REFILLABLE at nominal cost. Hose included for emergency tire inflator or air blast. Wt. 4 lbs. $19.50 value. Special..... **$6.95**

LARGE FIRE EXTINGUISHER (Item 57) commercial size, 5 x 14 in. (275 cu. in.) heavy ICC approved steel cylinder charged at 1000 lbs. or more with CO2. Equipped with genuine Kidde Valve. Refillable. Hose incl. Suitable for fire depts., stores, garages, homes, etc. Wt. 18 lbs. $42.50 value. Spec.. **$15.85**

IMMEDIATE DELIVERY ALL ITEMS

HEAVY DUTY ARC WELDER

(Item 38) Use as portable or shop welder. 250 amps, D.C., Senior model. Made for years of trouble-free, continuous service. Will handle light or heavy jobs. Weld up to ½" plate using ¼" rods. Built-in air-cooling system. Arc is easy to strike and hold, because of specially designed arc stabilizer. Hi-lo switch and dial control gives wide range of welding heats. Run welder at 2600 rpm. with tractor, jeep or 10 hp. gas engine, or 7 hp. elec. motor. Complete with instructions, guar. and double V belt or flat pulley. Wt. 110 lbs.
A $400 value at..... **$99.75**
MAGIC TERMINAL model same as above but with built-in 3rd terminal for low heat soldering and brazing. Special..... **$119.50**
WELDING KIT. Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at.... **$10.50**

28 pc. BENCH GRINDER KIT

(Item 71) A rugged precision Grinder powered by ¼ hp AC 110 v. 3500 rpm heavy duty motor. Equipped with tool rests and non-breakable safety eye-shields. 28 pc. kit incl. 2 grinding wheels, wire wheel, drill chuck, arbor, asst'd drills. 14 sanding and polishing discs, buffs, etc. All highest quality. 1 year guar. Wt. 17 lbs.
Drastically reduced..... **$21.95**

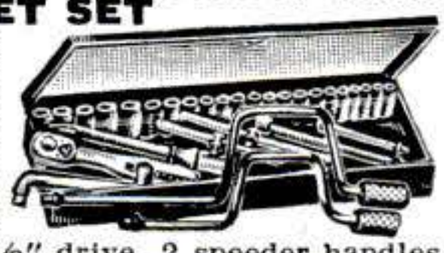
CARRY-AIR

(Item 32) Stainless steel tank—capacity 500 cu. in. at 400 lbs. press. complete with inlet and shutoff valves, press. gauge, detachable air hose, tire chuck. Fill at any service station. Carry air for tire inflation, blowing out lines, spray painting, insecticides, etc. One emergency pays back cost. Wt. 10 lbs.
Worth $20.00. Our price..... **$8.95**
(Item 55) With big double tank (1000 cu. in.)..... **$11.95**

POTTERS WHEEL

(Item 47) Complete, prof. equip. for making finest ceramics and pottery. Large dynamically balanced cast-aluminum reversible turntable with variable speed drive (38 to 140 rpm) controlled by foot-pedal. Built-in adjustable arm rests, water cup and wedging wire. 16x12" enclosed throwing table—ample area for largest pieces. Req. ¼ hp. motor (not incl.). Can be set up on 20x24" table and stored on edge. Complete with pulleys, belts and instructions. Wt. 26 lbs.
$145 value at..... **$59.95**

32 pc. SOCKET SET



(Item 59) Highest quality guar. non-breakable sockets made by Plomb, Snap On, etc. Complete range of 22 sockets from ¼" thru ¾" in ⅜" drive and 7/16" thru 1-1/16" in ½" drive. 2 speeder handles, 2 extensions, 2 slide heads, double ⅜ x ½ in. "L" handle, reversible ratchet, 12" Phillips type screw driver and metal tool box. For professional mechanics who want the best. Wt. 14 lbs. Easily worth $32.50, while they last..... **$15.95**

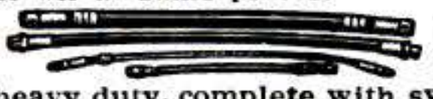
RUBBER HOSE

New genuine Neoprene Hose — outlasts ordinary rubber 3 to 1. Reinforced with super tough cotton cord plies. Flexible. Easy Flo brass couplings with standard pipe threads for quick connections, included. **Pump water for irrigation, stock tanks, home, barn, fire fighting, etc. Pump Gas or Fuel Oil.** Save more than 60%.

(Inside Diam.)	1"	1¼"	1¼"	1½"
Length	10 ft.	25 ft.	40 ft.	30 ft.
Price	5.95	9.25	14.75	14.75

If specified we will send special hose for gas or oil at same prices.

HYDRAULIC HOSE



High pressure, heavy duty, complete with swivel fittings. Pipe thread connections. Ideal for farm equip., bulldozers, grease guns, airbrakes, etc. Any length. Minimum $1 per lgth. INSIDE DIAMETER, ¼" 50¢ per ft. ⅜" 60¢, ½" 80¢, ⅝" 90¢.

Send 10c for a Big War Surplus Catalog. Included Free with Every Order.

EXTENSION CORD

(Item 16) 40 ft. heavy duty, made of specially insulated No. 14 2-conductor wire. So tough that you can drive over it and yet amazingly flexible and easy to handle. Resists oil, grease or water. Extends electricity up to 400 ft. without voltage drop. Use indoors or out. Complete with heavy rubber plug and outlet. Wt. 2½ lbs. Usually $4.50—Special 40 ft. **$1.99**
Comb: 2-40 ft. and 1-20 ft. (total 100 ft.) **$4.95**
100 foot length (one piece)..... **$4.85**
WIRE ONLY (Item 50) No fittings, 100 ft. **$4.00**
TRENCH-LAY WIRE. (Item 51) **Anaconda** #10—2 cond., for buried service to barns, outdoor lights, etc. Absolutely impervious to soil and moisture. Wt. 25 lbs. per 100 ft. Special surplus price. 100 ft. coils, **19¢** per ft.; 250 ft., **18¢** per ft.; 500 ft., **17¢** per ft.
POWER CABLE (Item 67) #12—2 cond. stranded, flexible, vinyl covered, impervious to everything. 50 ft. wt. 7 lbs..... **$15.95**
TELEPHONE WIRE. (Item 52) Genuine U.S. Army Signal Corps qual. #18—2 cond. reinf. with steel strands for great strength. ½ mile coil, wt. 60 lbs. **$9.95** 2 for **$18.50.**

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(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range, removes kitchen smoke and odors. Powerful continuous duty motor, 110-120 V. A.C. Quiet, super efficient fan moves huge volume of air (400 to 600 c.f.m.) 8" Fan, wt. 5 lb. **$6.35**; 9" Fan, wt. 6 lbs. **$7.45**; 10" Fan, wt. 7 lb. **$8.45**; 12" Fan, wt. 8 lbs. **$9.45.**

HIGH PRESSURE HAND PUMP

(Item 53) Positive displacement type. Cap. 550 gph. Completely self priming. ¾" pipe thread inlet and outlet. Use for fuel or water transfer on boats, trailers, air craft, etc. Ideal for insecticides, emerg. sump pump or as vacuum pump. Wt. 15 lbs. Govt. cost $95. Our Special..... **$12.95**

VARIABLE SPEED SELECTOR

(Item 68)

Heavy duty, made by **B. F. GOODRICH** for industrial use. Provides instant speed changes for any drive. For machine tools, dryers, printing, conveyors, production lines, hoists—any operation requiring variable speed. Ideal for midget autos. Employs reliable "trouble free" planetary system. No hydraulic power losses or creeping. Infinite range, smooth operation, easy installation. 3 sizes: ½-1 hp. wt. 36 lbs; 1-2 hp. wt. 55 lbs.; 2-3 hp. wt. 105 lbs. Reg. list $228, $252 and $352. Brand new, in Goodrich boxes and guaranteed. Complete installation data included. Unprecedented surplus sacrifice **$79.50, $89.50** and **$114.50.**

ELECTRIC HAND SAW

(Item 36) Most perfectly balanced and smoothest running saw made. Advanced design provides max. power and light weight. Easily adjusted for all angles, depth and width of cut. Comes complete with 6¼" comb. blade, ripping guide and 10 ft. hvy. duty cord. Built-in saw-dust blower. Autom. telescoping guard. 110-120 v. AC-DC. Depth of cut 2¼". 1 year written guar. Wt. 12 lbs.
Drastically reduced..... **$39.95**

GAUGE TESTER

(Item 27) Precision made of solid bronze and steel by Ashcroft. (Cat. #1300-5). Calibrated weights (incl.) acting against hydraulic piston provides quick accurate testing of all pressure gauges up to 500 psi. Brand new. Wt. 90 lbs. Reg. $318.00. Our Spec..... **$95.00**

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Bronze-bearing model (Item 70) ½" arbor, table 10"x13", wt. 34 lbs.... **$27.50**

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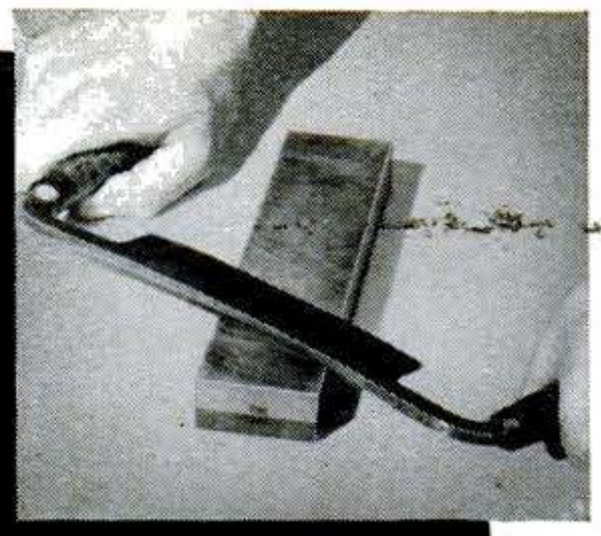

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Price of Dynamic Power Tool Combination complete is $26.95

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NO MONEY WITH ORDER—NO C. O. D.

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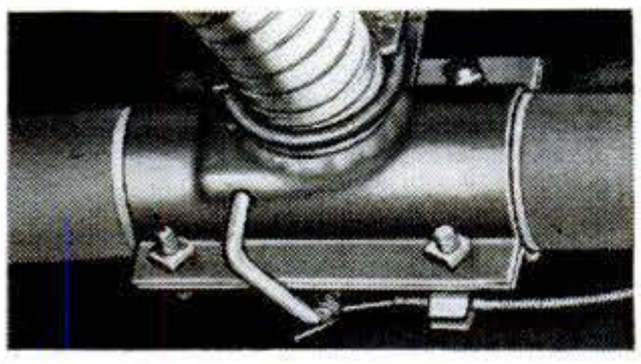

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This cut-out is well constructed; actually strengthens exhaust pipe; made of heavy plate steel, designed for easy installation—no special tools required. Fits all exhaust pipes from 1 3/4" to 2 1/4" size. Sent postpaid for only $6.95 check or money order. Satisfaction guaranteed or your money back.

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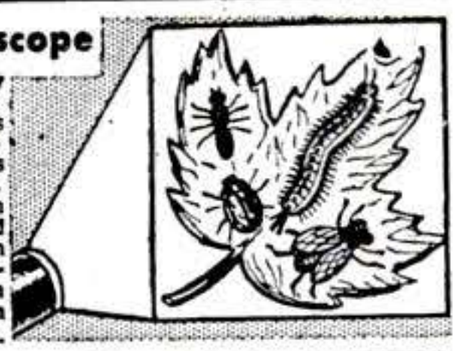

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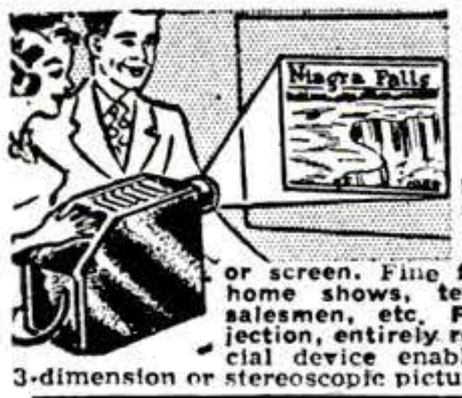

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Put on your own show by projecting snapshots, pictures, post cards, photos, comics, clippings, etc. on wall or screen. Fine for school, clubs, talks, home shows, telling about your trip, salesmen, etc. Full color, correct projection, entirely readable & correct. Special device enables you to project real 3-dimension or stereoscopic pictures. Startling, life-like.

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[*Continued from page 171*]

of the Chamber of Commerce, the parking problem smacked him in the face.

In struggling for a solution he evolved the idea of a timing device to indicate how long a car has been parked. Magee took his idea to Oklahoma A. & M. At that college Gerald A. Hale, professor of mechanical engineering, became so interested he quit teaching to enter partnership with Magee. Hale worked out the essential mechanism.

Hostile Merchants Won Over

Then, on July 16, 1935, the city awoke to discover 150 meters installed. For test purposes they were placed on one side of the street in one block and the other side in the next. Thus every block along the business streets had a free side and a metered side. National attention had been aroused. The wire services had teletyped articles throughout the country. Newsreel cameramen were at hand.

Hale remembers that morning vividly. By 9 o'clock the free side of each block was filled with cars, and the metered side was discouragingly, blankly empty. Merchants on the metered side reacted quickly with telephoned complaints to the City Hall. Some of them burned the wires. By 11 o'clock, as shoppers came to town, the metered sections began to fill, with a steady turnover of cars. Throughout the day the metered sections remained relatively full, but a motorist could always find a parking place. The non-metered side had slow turnover. By the end of three days merchants on the free side had petitioned the City Council to install meters on their side, too.

Meters Win Court Tests

But the going in those first years was slow. In 1936 about 8,000 meters were sold; and the next three years brought average sales of only 4,000. The meter business didn't begin to boom until 1946, when postwar prosperity brought intensified parking problems.

Parking meters have resulted in suits in 28 states. Most frequent plaintiff is the merchant who demands the right to park his own car free in front of his store. Courts in 24 states have held in favor of the meter, ruling that the businessman has no control over the street. In four states rulings were against the meters on the ground that they constitute unauthorized taxation. In these states, however, legislative action later made the meters valid.

Two other problems have plagued the parking-meter industry; how to make the meters foolproof, and how to make them theftproof.

A segment of the American public accepted the parking meter as a challenge to its ingenuity. Chewing gum, hairpins, paper clips and cardboard stopped up the coin receivers. Slugs have not caused as much trouble as had been expected. How to prevent theft brought some head scratching. Today meters may be equipped with sealed coin cases which are replaced by the collector but cannot be opened by him.

Meters Make Money

While the major purpose of the parking meter is to help break the parking bottleneck in central business sections, it has proved to be a rich source of revenue for city government. Oklahoma City by October 1948—13 years after the meters were installed—went over $1,000,000 in total collections. Cleveland has passed the $2,000,000 mark. San Francisco in a single year netted $735,486.94. Dallas averages $275,000 annually.

By and large, the revenues go into general city funds. However, there is a trend, backed by the National Safety Council and other concerned organizations, to earmark these revenues by legislation for the improvement of traffic conditions. About one-third of the cities apply the meter intake to improving traffic conditions, for example by establishing parking lots.

What's the future for the parking-meter industry? Have we reached the saturation point? The various company officials interviewed were optimistic on this score. New improvements in meters bring orders for replacements. Many cities have now begun installing meters in suburban areas. But most fruitful of future sales is the municipally owned parking lot. Many cities have begun to operate parking lots with meters. These meters will permit parking for 12 minutes for one cent and on up to ten hours for 25 cents.

It looks as though you and I might just as well make up our minds that we'll be putting coins in parking meters for a long time to come. END

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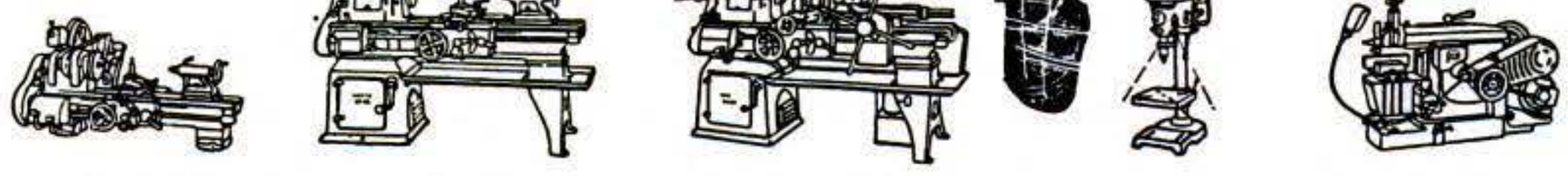

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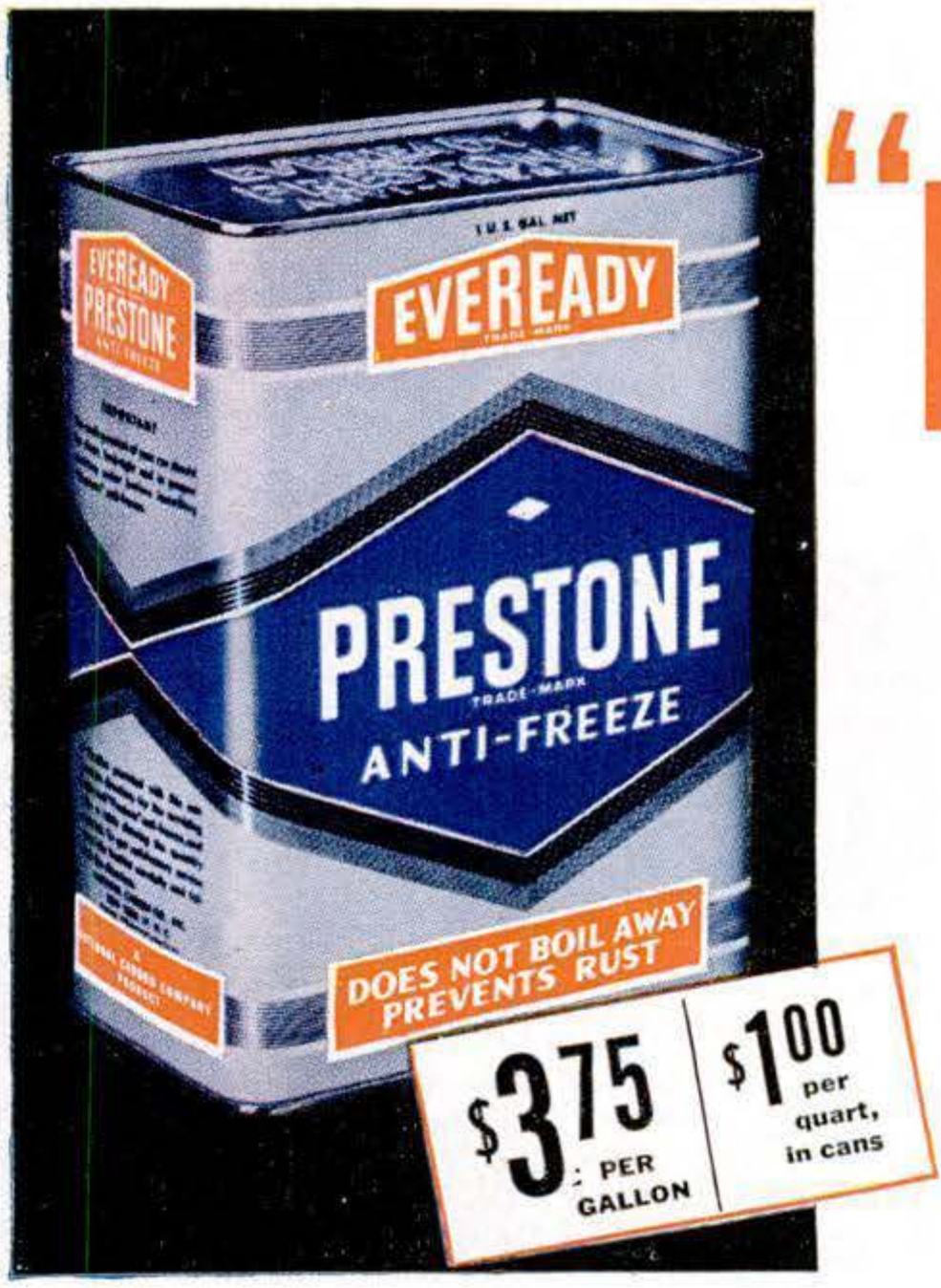

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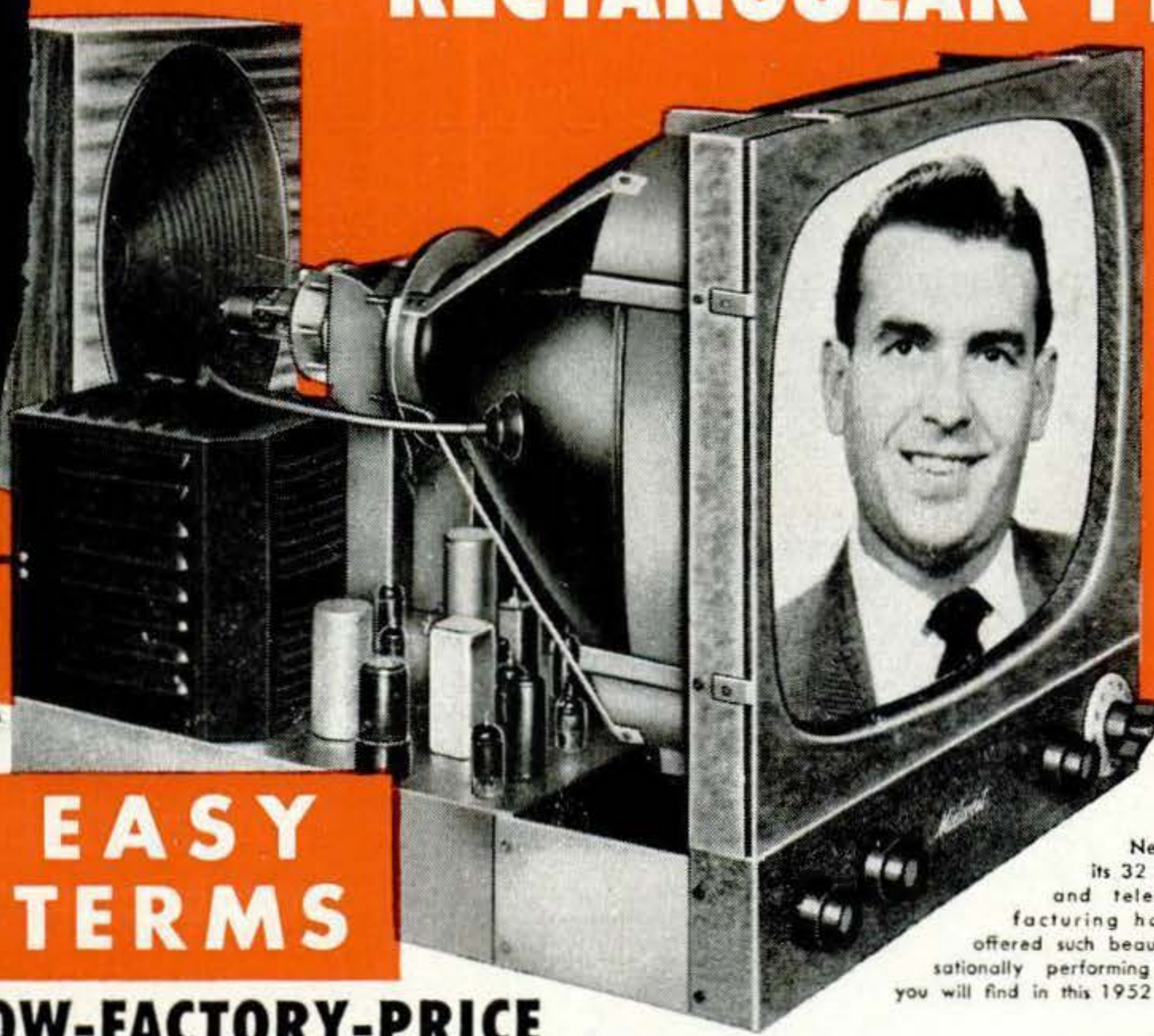

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